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Light emitting device including capping layers on respective emissive regions

Abstract

An opto-electronic device having a plurality of layers, comprising a first capping layer (CPL) comprising a first CPL material and disposed in a first emissive region configured to emit photons having a first wavelength spectrum that is characterized by a first onset wavelength; and a second CPL comprising a second CPL material and disposed in a second emissive region configured to emit photons having a second wavelength spectrum that is characterized by a second onset wavelength; wherein at least one of the first CPL and the first CPL material (CPL(m)1) exhibits a first absorption edge at a first absorption edge wavelength that is shorter than the first onset wavelength; and at least one of the second CPL and the second CPL material (CPL(m)2) exhibits a second absorption edge at a second absorption edge wavelength that is shorter than the second onset wavelength.

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Background/Summary

RELATED APPLICATIONS (1) The present application is a continuation of U.S. application Ser. No. 17/789,127 filed Jun. 24, 2022, which is a 371 National Stage Entry of International Application No. PCT/IB2020/062423, filed Dec. 24, 2020, which claims the benefit of priority to U.S. Provisional Patent Application No. 62/953,442 filed Dec. 24, 2019, the contents of which are incorporated herein by reference in their entirety.

TECHNICAL FIELD
(1) The present disclosure relates to opto-electronic devices and in particular to an opto-electronic device having multiple emissive regions, each comprising first and second electrodes separated by a semiconductor layer and having a capping layer having optical properties tuned to the emission spectrum wavelength range generated by the emissive region.
BACKGROUND
(2) In an opto-electronic device such as an organic light emitting diode (OLED), at least one semiconducting layer is disposed between a pair of electrodes, such as an anode and a cathode. The anode and cathode are electrically coupled to a power source and respectively generate holes and electrons that migrate toward each other through the at least one semiconducting layer. When a pair of holes and electrons combine, a photon may be emitted.
(3) OLED display panels may comprise a plurality of (sub-) pixels, each of which has an associated pair of electrodes. Various layers and coatings of such panels are typically formed by vacuum-based deposition techniques.
(4) In some applications, it may be desirable to provide a conductive coating and/or electrode coating in a pattern for each (sub-) pixel of the panel across either or both of a lateral and a cross-

sectional aspect thereof, by selective deposition of the conductive coating to form a device feature, such as, without limitation, an electrode and/or a conductive element electrically coupled thereto, during the OLED manufacturing process.
(5) One method for doing so, in some non-limiting applications, involves the interposition of a fine metal mask (FMM) during deposition of an electrode material and/or a conductive element electrically coupled thereto. However, materials typically used as electrodes have relatively high evaporation temperatures, which impacts the ability to re-use the FMM and/or the accuracy of the pattern that may be achieved, with attendant increases in cost, effort and complexity.
(6) One method for doing so, in some non-limiting examples, involves depositing the electrode material and thereafter removing, including by a laser drilling process, unwanted regions thereof to form the pattern. However, the removal process often involves the creation and/or presence of debris, which may affect the yield of the manufacturing process.
(7) Further, such methods may not be suitable for use in some applications and/or with some devices with certain topographical features.
(8) In some applications, it may be desirable to provide an opto-electronic device having multiple emissive regions each having optical characteristics tuned to a wavelength spectrum emitted thereby.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) Examples of the present disclosure will now be described by reference to the following figures, in which identical reference numerals in different figures indicate identical and/or in some non-limiting examples, analogous and/or corresponding elements and in which:
(2) FIG. **1** is a block diagram from a cross-sectional aspect, of an example electro-luminescent device according to an example in the present disclosure;
(3) FIG. **2** is a cross-sectional view of an example backplane layer of the substrate of the device of FIG. **1**, showing a thin film transistor (TFT) embodied therein;
(4) FIG. **3** is a circuit diagram for an example circuit such as may be provided by one or more of the TFTs shown in the backplane layer of FIG. **2**;
(5) FIG. **4** is a cross-sectional view of the device of FIG. **1**;
(6) FIG. **5** is a cross-sectional view of an example version of the device of FIG. **1**, showing at least one example pixel definition layer (PDL) supporting deposition of at least one second electrode of the device;
(7) FIG. **6** is an example energy profile illustrating relative energy states of an adatom absorbed onto a surface according to an example in the present disclosure;
(8) FIG. **7** is a schematic diagram showing an example process for depositing a selective coating in a pattern on an exposed layer surface of an underlying material in an example version of the device of FIG. **1**, according to an example in the present disclosure;
(9) FIG. **8** is a schematic diagram showing an example process for depositing a conductive coating in the first pattern on an exposed layer surface that comprises the deposited pattern of the selective coating of FIG. **7** where the selective coating is a nucleation-inhibiting coating (NIC);
(10) FIGS. **9**A-D are schematic diagrams showing example open masks, suitable for use with the process of FIG. **7**, having an aperture therewithin according to an example in the present disclosure;
(11) FIG. **10**A is an example version of the device of FIG. **1**, with additional example deposition steps according to an example in the present disclosure;
(12) FIG. **10**B is an example version of the device of FIG. **10**A, in which the first portion includes a discontinuous coating;

(13) FIG. **10**C is a plan view of the first portion of the device of FIG. **10**B;
(14) FIG. **10**D is an example version of the device of FIG. **10**A, further comprising a third portion;
(15) FIG. **10**E is a plan view of a portion of the device of FIG. **10**D;
(16) FIG. **11**A is a schematic diagram showing an example process for depositing a selective coating that is a nucleation-promoting coating (NPC) in a pattern on an exposed layer surface that comprises the deposited pattern of the selective coating of FIG. **9**;
(17) FIG. **11**B is a schematic diagram showing an example process for depositing a conductive coating in a pattern on an exposed layer surface that comprises the deposited pattern of the NPC of FIG. **11**A;
(18) FIG. **12**A is a schematic diagram showing an example process for depositing an NPC in a pattern on an exposed layer surface of an underlying material in an example version of the device of FIG. **1**, according to an example in the present disclosure;
(19) FIG. **12**B is a schematic diagram showing an example process of depositing an NIC in a pattern on an exposed layer surface that comprises the deposited pattern of the NPC of FIG. **12**A;
(20) FIG. **12**C is a schematic diagram showing an example process for depositing a conductive coating in a pattern on an exposed layer surface that comprises the deposited pattern of the NIC of FIG. **12**B;
(21) FIGS. **13**A-**13**C are schematic diagrams that show example stages of an example printing process for depositing a selective coating in a pattern on an exposed layer surface in an example version of the device of FIG. **1**, according to an example in the present disclosure;
(22) FIG. **14** is a schematic diagram illustrating, in plan view, an example patterned electrode suitable for use in a version of the device of FIG. **1**, according to an example in the present disclosure;
(23) FIG. **15** is a schematic diagram illustrating an example cross-sectional view of the device of FIG. **14** taken along line **15-15**;
(24) FIG. **16**A is a schematic diagram illustrating, in plan view, a plurality of example patterns of electrodes suitable for use in an example version of the device of FIG. **1**, according to an example in the present disclosure;
(25) FIG. **16**B is a schematic diagram illustrating an example cross-sectional view, at an intermediate stage, of the device of FIG. **16**A taken along line **16**B-**16**B;
(26) FIG. **16**C is a schematic diagram illustrating an example cross-sectional view of the device of FIG. **16**A taken along line **16**C-**16**C;
(27) FIG. **17** is a schematic diagram illustrating a cross-sectional view of an example version of the device of FIG. **1**, having an example patterned auxiliary electrode according to an example in the present disclosure;
(28) FIG. **18**A is a schematic diagram illustrating, in plan view, an example arrangement of emissive region(s) and/or non-emissive region(s) in an example version of the device of FIG. **1**, according to an example in the present disclosure;
(29) FIGS. **18**B-**18**D are schematic diagrams each illustrating a segment of a part of FIG. **18**A, showing an example auxiliary electrode overlaying a non-emissive region according to an example in the present disclosure;
(30) FIG. **19** is a schematic diagram illustrating, in plan view an example pattern of an auxiliary electrode overlaying at least one emissive region and at least one non-emissive region according to an example in the present disclosure;
(31) FIG. **20**A is a schematic diagram illustrating, in plan view, an example pattern of an example version of the device of FIG. **1**, having a plurality of groups of emissive regions in a diamond configuration according to an example in the present disclosure;
(32) FIG. **20**B is a schematic diagram illustrating an example cross-sectional view of the device of FIG. **20**A taken along line **20**B-**20**B;
(33) FIG. **20**C is a schematic diagram illustrating an, example cross-sectional view of the device of

FIG. **20**A taken along line **20**C-**20**C;
(34) FIG. **21** is a schematic diagram illustrating an example cross-sectional view of an example version of the device of FIG. **4** with additional example deposition steps according to an example in the present disclosure;
(35) FIG. **22** is a schematic diagram illustrating an example cross-sectional view of an example version of the device of FIG. **4** with additional example deposition steps according to an example in the present disclosure;
(36) FIG. **23** is a schematic diagram illustrating an example cross-sectional view of an example version of the device of FIG. **4** with additional example deposition steps according to an example in the present disclosure;
(37) FIG. **24** is a schematic diagram illustrating an example cross-sectional view of an example version of the device of FIG. **4** with additional example deposition steps according to an example in the present disclosure;
(38) FIGS. **25**A-**25**C are schematic diagrams that show example stages of an example process for depositing a conductive coating in a pattern on an exposed layer surface of an example version of the device of FIG. **1**, by selective deposition and subsequent removal process, according to an example in the present disclosure;
(39) FIG. **26**A is a schematic diagram illustrating, in plan view, an example of a transparent version of the device of FIG. **1** comprising at least one example pixel region and at least one example light-transmissive region, with at least one auxiliary electrode according to an example in the present disclosure;
(40) FIG. **26**B is a schematic diagram illustrating an example cross-sectional view of the device of FIG. **26**A taken along line **26**B-**26**B;
(41) FIG. **27**A is a schematic diagram illustrating, in plan view, an example of a transparent version of the device of FIG. **1** comprising at least one example pixel region and at least one example light-transmissive region according to an example in the present disclosure;
(42) FIG. **27**B is a schematic diagram illustrating an example cross-sectional view of the device of FIG. **27**A taken along line **27**B-**27**B;
(43) FIG. **27**C is a schematic diagram illustrating another example cross-sectional view of the device of FIG. **27**A taken along line **27**B-**27**B;
(44) FIGS. **28**A-**28**D are schematic diagrams that show example stages of an example process for manufacturing an example version of the device of FIG. **1** to provide two emissive regions each having a second electrode of different thickness according to an example in the present disclosure;
(45) FIGS. **29**A-**29**D are schematic diagrams that show example stages of an example process for manufacturing an example version of the device of FIG. **1** having sub-pixel regions having a second electrode of different thickness according to an example in the present disclosure;
(46) FIG. **30** is a schematic diagram illustrating an example cross-sectional view of an example version of the device of FIG. **1** in which a second electrode is coupled to an auxiliary electrode according to an example in the present disclosure;
(47) FIGS. **31**A-**31**I are schematic diagrams that show various potential behaviours of an NIC at a deposition interface with a conductive coating in an example version of the device of FIG. **1**, according to various examples in the present disclosure;
(48) FIG. **32** is a schematic diagram that illustrates, in qualitative form, a relationship between example emission spectra for a pair of example emissive regions and plots of example refractive indices of respective capping layers overlying the emissive regions according to various examples in the present disclosure;
(49) FIG. **33** is a schematic diagram that illustrates, in qualitative form, a relationship between the plots of the example refractive indices of FIG. **32**, and respective plots of example extinction coefficients of the respective capping layers of FIG. **32** according to various examples in the present disclosure;

(50) FIG. **34** is a schematic diagram that illustrates, in qualitative form, a relationship between the example emission spectra of FIG. **32**, and the respective plots of example extinction coefficients of FIG. **33** according to various examples in the present disclosure;
(51) FIG. **35** is a schematic diagram that illustrates a metallic coating underlying an NIC and/or a conductive coating according to an example in the present disclosure;
(52) FIGS. **36**A-**36**B are schematic diagrams that show example stages of an example process for manufacturing an example version of the device of FIG. **1** subsequent to the stages of FIGS. **28**A-**28**B;
(53) FIGS. **37**A-**37**E are schematic diagrams that show example stages of an example process for manufacturing an example version of the device of FIG. **1** to provide three emissive regions each having a second electrode of different thickness according to an example in the present disclosure;
(54) FIGS. **38**A-**38**F are schematic diagrams that show example stages of an example process for manufacturing an example version of the device of FIG. **1** having sub-pixel regions having a second electrode of different thickness according to an example in the present disclosure;
(55) FIGS. **39**A-**39**C are schematic diagrams that show example versions of the device of FIG. **1** according to an example in the present disclosure; and
(56) FIG. **40** is a schematic diagram illustrating the formation of a film nucleus according to an example in the present disclosure.
(57) In the present disclosure, for purposes of explanation and not limitation, specific details are set forth in order to provide a thorough understanding of the present disclosure, including, without limitation, particular architectures, interfaces and/or techniques. In some instances, detailed descriptions of well-known systems, technologies, components, devices, circuits, methods and applications are omitted so as not to obscure the description of the present disclosure with unnecessary detail.
(58) Further, it will be appreciated that block diagrams reproduced herein can represent conceptual views of illustrative components embodying the principles of the technology.
(59) Accordingly, the system and method components have been represented where appropriate by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the examples of the present disclosure, so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein.
(60) Any drawings provided herein may not be drawn to scale and may not be considered to limit the present disclosure in any way.
(61) Any feature or action shown in dashed outline may in some examples be considered as optional.

SUMMARY

(62) It is an object of the present disclosure to obviate or mitigate at least one disadvantage of the prior art.
(63) The present disclosure discloses an opto-electronic device having a plurality of layers. A first capping layer (CPL) comprises a first CPL material and is disposed in a first emissive region. A second CPL comprises a second CPL material and is disposed in a second emissive region. The first emissive region is configured to emit photons having a first wavelength spectrum that is characterized by a first onset wavelength. The second emissive region is configured to emit photons having a second wavelength spectrum that is characterized by a second onset wavelength. At least one of the first CPL and the first CPL material (collectively “CPL(m)1”) exhibits a first absorption edge at a first absorption edge wavelength that is shorter than the first onset wavelength. At least one of the second CPL and the second CPL material (collectively “CPL(m)2”) exhibits a second absorption edge at a second absorption edge wavelength that is shorter than the second onset wavelength.
(64) According to a broad aspect of the present disclosure, there is disclosed an opto-electronic

device having a plurality of layers, comprising: a first capping layer (CPL) comprising a first CPL material and disposed in a first emissive region, the first emissive region configured to emit photons having a first wavelength spectrum that is characterized by a first onset wavelength; and a second CPL comprising a second CPL material and disposed in a second emissive region, the second emissive region configured to emit photons having a second wavelength spectrum that is characterized by a second onset wavelength, wherein: at least one of the first CPL and the first CPL material (CPL(m)1) exhibits a first absorption edge at a first absorption edge wavelength that is shorter than the first onset wavelength; and at least one of the second CPL and the second CPL material (CPL(m)2) exhibits a second absorption edge at a second absorption edge wavelength that is shorter than the second onset wavelength.

(65) In some non-limiting examples, the first onset wavelength may be shorter than the second onset wavelength. In some non-limiting examples, the first absorption edge wavelength is shorter than the second absorption edge wavelength.

(66) In some non-limiting examples, the first absorption edge may be characterized by a first extinction wavelength at which an extinction coefficient k of the CPL(m)1 equals a threshold value and the second absorption edge may be characterized by a second extinction wavelength at which an extinction coefficient of the CPL(m)2 equals the threshold value.

(67) In some non-limiting examples, the first onset wavelength may be longer than the first absorption edge wavelength by less than at least one of about 50 nm, about 40 nm, about 35 nm, about 30 nm, about 25 nm, about 20 nm, about 15 nm, about 10 nm, about 5 nm, and about 3 nm. In some non-limiting examples, the first extinction wavelength may be a longest one of at least one wavelength at which the extinction coefficient of the CPL(m)1 equals the threshold value. In some non-limiting examples, a first derivative of the extinction coefficient of the CPL(m) as a function of wavelength may be negative at the first extinction wavelength. In some non-limiting examples, the extinction coefficient of the CPL(m)1 at a wavelength longer than the first extinction wavelength may be less than the threshold value. In some non-limiting examples, the extinction coefficient of the CPL(m)1 at all wavelengths longer than the first extinction wavelength may be less than the threshold value. In some non-limiting examples, the extinction coefficient of the CPL(m)1 at any wavelength longer than the first onset wavelength may be less than at least one of about 0.1, about 0.09, about 0.08, about 0.06, about 0.05, about 0.03, about 0.01, about 0.005, and about 0.0001. In some non-limiting examples, the extinction coefficient of the CPL(m)1 at a wavelength shorter than the first absorption edge wavelength may exceed at least one of about 0.1, about 0.12, about 0.13, about 0.15, about 0.18, about 0.2, about 0.25, about 0.3, about 0.5, about 0.7, about 0.75, about 0.8, about 0.9, and about 1.0.

(68) In some non-limiting examples, a refractive index of the CPL(m)1 for at least one wavelength longer than the first absorption edge wavelength may exceed the refractive index of the CPL(m)1 for at least one wavelength shorter than the first absorption wavelength. In some non-limiting examples, the refractive index of the CPL(m) in at least one wavelength in the first wavelength spectrum may exceed at least one of about 1.8, about 1.9, about 1.95, about 2, about 2.05, about 2.1, about 2.2, about 2.3, and about 2.5.

(69) In some non-limiting examples, the second onset wavelength may be longer than the second absorption edge wavelength by less than at least one of about 200 nm, about 150 nm, about 130 nm, about 100 nm, about 80 nm, about 70 nm, about 60 nm, about 50 nm, about 40 nm, about 35 nm, about 25 nm, about 20 nm, about 15 nm, and about 10 n. In some non-limiting examples, the second extinction wavelength may be a longest one of at least one wavelength at which the extinction coefficient of the CPL(m)2 equals the threshold value. In some non-limiting examples, a first derivative of the extinction coefficient of the CPL(m)2 as a function of wavelength may be negative at the second extinction wavelength. In some non-limiting examples, the extinction coefficient of the CPL(m)2 at a wavelength longer than the second extinction wavelength may be less than the threshold value. In some non-limiting examples, the extinction coefficient of the

CPL(m)2 at all wavelengths longer than the second extinction wavelength may be less than the threshold value. In some non-limiting examples, the extinction coefficient of the CPL(m)2 at any wavelength longer than the second onset wavelength may be less than at least one of about 0.1, about 0.09, about 0.08, about 0.06, about 0.05, about 0.03, about 0.01, about 0.005, and about 0.0001. In some non-limiting examples, the extinction coefficient of the CPL(m)2 at a wavelength shorter than the second absorption edge wavelength may exceed at least one of about 0.1, about 0.12, about 0.13, about 0.15, about 0.18, about 0.2, about 0.25, about 0.3, about 0.5, about 0.7, about 0.75, about 0.8, about 0.9, and about 1.0.
(70) In some non-limiting examples, a refractive index of the CPL(m)2 for at least one wavelength longer than the second absorption edge wavelength may exceed the refractive index of the CPL(m)2 for at least one wavelength shorter than the second absorption edge wavelength. IN some non-limiting examples, the refractive index of the CPL(m)2 in at least one wavelength in the second wavelength spectrum may exceed at least one of about 1.8, about 1.9, about 1.95, about 2, about 2.05, about 2.1, about 2.2, about 2.3, and about 2.5.
(71) In some non-limiting examples, the extinction coefficient of the CPL(m)1 may be less than the threshold value at the second onset wavelength. In some non-limiting examples, the extinction coefficient of the CPL(m)1 may be less than the threshold value at all wavelengths in the second wavelength spectrum. In some non-limiting examples, the extinction coefficient of the CPL(m)1 at any wavelength in the second wavelength spectrum may be less than at least one of about 0.1, about 0.09, about 0.08, about 0.05, about 0.05, about 0.03, about 0.01, about 0.005, and about 0.001.
(72) In some non-limiting examples, a refractive index of the CPL(m)1 for at least one wavelength in the first wavelength spectrum may exceed the refractive index of the CPL(m)1 for at least one wavelength in the second wavelength spectrum. In some non-limiting examples, a refractive index of the CPL(m)2 for at least one wavelength in the second wavelength spectrum may exceed the refractive index of the CPL(m)2 for at least one wavelength in the first wavelength spectrum. In some non-limiting examples, a refractive index of the CPL(m)1 for at least one wavelength of the second wavelength spectrum may be less than at least one of about 1.8, about 1.7, about 1.65, about 1.6, about 1.5, about 1.45, about 1.4, and about 1.3. In some non-limiting examples, a refractive index of the CPL(m)2 in at least one wavelength of the first wavelength spectrum may be less than at least one of about 1.8, about 1.7, about 1.65, about 1.6, about 1.5, about 1.45, about 1.4, and about 1.3.
(73) In some non-limiting examples, the extinction coefficient of the CPL(m)2 may exceed the extinction coefficient of the CPL(m)1 for at least one wavelength in the first wavelength spectrum. In some non-limiting examples, the extinction coefficient of the CPL(m)2 may exceed the extinction coefficient of the CPL(m)1 for every wavelength in the first wavelength spectrum.
(74) In some non-limiting examples, the threshold value may be at least one of 0.1, 0.09, 0.08, 0.06, 0.05, 0.03, 0.01, 0.005, and 0.001.
(75) In some non-limiting examples, the first emissive region and the second emissive region may occupy different regions of the device in a lateral aspect.
(76) In some non-limiting examples, the first wavelength spectrum and the second wavelength spectrum lie in the visible spectrum. In some non-limiting examples, the first wavelength spectrum may have a first peak wavelength and the second wavelength spectrum may have a second peak wavelength that is longer than the first peak wavelength.
(77) In some non-limiting examples, the first onset wavelength may be a shortest one of at least one wavelength at which an intensity of the first wavelength spectrum may be at least one of about 20%, about 15%, about 10%, about 5%, about 3%, about 1%, and about 0.01% of an intensity at the first peak wavelength. In some non-limiting examples, the second onset wavelength may be a shortest one of at least one wavelength at which an intensity of the second wavelength spectrum may be at least one of about 20%, about 15%, about 10%, about 5%, about 3%, about 1%, and

about 0.01% of an intensity at the second peak wavelength.

(78) In some non-limiting examples, the first wavelength spectrum may correspond to a colour that is at least one of B(lue) and G(reen). In some non-limiting examples, the second wavelength spectrum may correspond to a colour that is at least one of R(ed) and G(reen). In some non-limiting examples, the first wavelength spectrum may correspond to a colour that is B(lue) and the second wavelength spectrum may correspond to a colour that is at least one of G(reen) and R(ed). In some non-limiting examples, the first wavelength spectrum may correspond to a colour that is G(reen) and the second wavelength spectrum may correspond to a colour that is R(ed).

(79) In some non-limiting examples, the first CPL material may have a different composition from the second CPL material.

(80) In some non-limiting examples, a thickness of the first CPL may be the same as a thickness of the second CPL. In some non-limiting examples, a thickness of the first CPL may be different from a thickness of the second CPL.

(81) In some non-limiting examples, a thickness of the first CPL may be in a range of between about 5 to about 120 nm. In some non-limiting examples, a thickness of the first CPL may exceed at least one of about 10 nm, about 15 nm, about 20 nm, about 25 nm, about 30 nm, and about 40 nm. In some non-limiting examples, a thickness of the first CPL may be less than at least one of about 100 nm, about 90 nm, about 80 nm, and about 70 nm.

(82) In some non-limiting examples, a thickness of the second CPL may be in a range of between about 5 nm to about 120 nm. In some non-limiting examples, a thickness of the second CPL may exceed at least one of about 10 nm, about 15 nm, about 20 nm, about 25 nm, about 30 nm, and about 40 n. In some non-limiting examples, a thickness of the second CPL may be less than about 100 nm, about 90 nm, about 80 nm, and about 70 nm.

(83) In some non-limiting examples, the device may further comprise at least one electrode coating in the first emissive region and the second emissive region. In some non-limiting examples, the first CPL may be disposed on an exposed layer surface of the at least one electrode coating. In some non-limiting examples, the second CPL may be disposed on an exposed layer surface of the at least one electrode coating. IN some non-limiting examples, the at least one electrode coating may have a first electrode thickness in the first emissive region. In some non-limiting examples, the at least one electrode coating may have a second electrode thickness in the second emissive region.

(84) In some non-limiting examples, the first electrode thickness may be less than the second electrode thickness. In some non-limiting examples, a quotient of the first electrode thickness divided by the second electrode thickness may be less than at least one of about 0.9, about 0.8, about 0.7, about 0.6, about 0.5, about 0.4, about 0.3, and about 0.2. In some non-limiting examples, the first electrode thickness may be in a range that is at least one of about 5 nm to about 100 nm, about 5 nm to about 50 nm, about 5 nm to about 25 nm, about 5 nm to about 20 nm, about 5 nm to about 15 nm, about 8 nm to about 15 nm, about 8 nm to about 12 nm, and about 8 nm to about 10 nm. In some non-limiting examples, the second electrode thickness may be in a range that is at least one of about 10 nm to about 60 nm, about 10 nm to about 50 nm, about 15 nm to about 40 nm, about 15 nm to about 35 nm, and about 20 nm to about 35 nm.

(85) In some non-limiting examples, the second electrode thickness may be less than the first electrode thickness. In some non-limiting examples, a quotient of the second electrode thickness divided by the first electrode thickness may be less than at least one of about 0.9, about 0.8, about 0.7, about 0.6, about 0.5, about 0.4, about 0.3, and about 0.2. In some non-limiting examples, the first electrode thickness may be in a range that is at least one of about 10 nm to about 60 nm, about 10 nm to about 50 nm, about 15 nm to about 40 nm, about 15 nm to about 35 nm, and about 20 nm to about 35 nm. In some non-limiting examples, the second electrode thickness may be in a range that is at least one of about t nm to about 100 nm, about 5 nm to about 50 nm, about 5 nm to about 25 nm, about 5 nm to about 20 nm, about 5 nm to about 15 nm, about 8 nm to about 15 nm, about 8 nm to about 12 nm, and about 8 nm to about 10 nm.

(86) In some non-limiting examples, the at least one electrode coating may comprise a metallic coating and a conductive coating disposed on an exposed layer surface of the metallic coating. In some non-limiting examples, the conductive coating may extend between the metallic coating and the second CPL in the second emissive region. In some non-limiting examples, the first CPL may be disposed on an exposed layer surface of the metallic coating in the first emissive region. In some non-limiting examples, the conductive coating may extend between the metallic coating and the first CPL in the first emissive region.
(87) In some non-limiting examples, the metallic coating may be comprised of a metallic coating material. In some non-limiting examples, the metallic coating material may comprise a metal having a bond dissociation energy in a diatomic molecule thereof at 298K of at least one of at least 10 kJ/mol, at least 50 kJ/mol, at least 100 kJ/mol, at least 150 kJ/mol, at least 180 kJ/mol, and at least 200 kJ/mol. In some non-limiting examples, the metallic coating material may comprise an element having an electronegativity less than at least one of about 1.4, about 1.3, and about 1.2.
(88) In some non-limiting examples, the metallic coating material may comprise an element selected from potassium (K), sodium (Na), lithium (Li), barium (Ba), cesium (Cs), ytterbium (Yb), silver (Ag), gold (Au), copper (Cu), aluminum (Al), magnesium (Mg), zinc (Zn), cadmium (Cd), tin (Sn), nickel (Ni), titanium (Ti), palladium (Pd), chromium (Cr), iron (Fe), cobalt (Co), zirconium (Zr), platinum (Pt), vanadium (V), niobium (Nb), iridium (Ir), osmium (Os), tantalum (Ta), molybdenum (Mo), tungsten (W), and any combination of any of these. In some non-limiting examples, the element may be selected from Cu, Ag, Au, and any combination of any of these. In some non-limiting examples, the element may be Cu. In some non-limiting examples, the element may be Al. In some non-limiting examples, the element may be selected from Mg, Zn, Cd, Yb, and any combination of nay of these. In some non-limiting examples, the element may be selected from Sn, Ni, Ti, Pd, Cr, Fe, Co, and any combination of any of these. In some non-limiting examples, the element may be selected from Zr, Pt, V, Nb, Ir, Os, and any combination of any of these. In some non-limiting examples, the element may be selected from Ta, Mo, W, and any combination of any of these. In some non-limiting examples, the element may be selected from Mg, Ag, Al, Yb, Li, and any combination of any of these. In some non-limiting examples, the element may be selected from any one of Mg, Ag, Al, Yb, and any combination of any of these. In some non-limiting examples, the element may be selected from Mg, Ag, Yb, and any combination of any of these. In some non-limiting examples, the element may be selected from Mg, Ag, and any combination of any of these. In some non-limiting examples, the element may be Ag.
(89) In some non-limiting examples, the metallic coating material may comprise a pure metal. In some non-limiting examples, the pure metal may be at least one of pure silver (Ag) and substantially pure Ag. In some non-limiting examples, the pure metal may be at least one of pure magnesium (Mg) and substantially pure Mg. In some non-limiting examples, the pure metal may be at least one of pure aluminum (Al) and substantially pure Al.
(90) In some non-limiting examples, the metallic coating material may comprise an alloy. In some non-limiting examples, the alloy may be at least one of a silver (Ag) containing alloy, and a silver-magnesium (AgMg)-containing alloy.
(91) In some non-limiting examples, the metallic coating may comprise oxygen (O). In some non-limiting examples, the metallic coating may comprise O and at least one metal. In some non-limiting examples, the metallic coating may comprise a metal oxide. In some non-limiting examples, the metal oxide may comprise zinc (Zn), indium (I), tin (Sn), antimony (Sb), gallium (Ga), and any combination of any of these. In some non-limiting examples, the metal oxide may be a transparent conducting oxide (TCO). In some non-limiting examples, the TCO may be at least one of indium titanium oxide (ITO), zinc oxide (ZnO), indium zinc oxide (IZO), indium gallium zinc oxide (IGZO), and any combination of any of these.
(92) In some non-limiting examples, the metallic coating may comprise a plurality of layers of the metallic coating material. In some non-limiting examples, the metallic coating material of a first

one of the plurality of layers may be different from the metallic coating material of a second one of the plurality of layers. In some non-limiting examples, the metallic coating material of at least one of the plurality of layers may comprise ytterbium (Yb). In some non-limiting examples, the metallic coating material of another one of the plurality of layers may comprise at least one of a silver (Ag)-containing alloy, and a silver-magnesium (AgMg)-containing alloy. In some non-limiting examples, the metallic coating material of another one of the plurality of layers may comprise at least one of pure silver (Ag), substantially pure (Ag), pure magnesium (Mg), substantially pure Mg, and any combination of any of these. In some non-limiting examples, the metallic coating material of one of the plurality of layers proximate to the NIC comprises an element selected from silver (Ag), gold (Au), copper (Cu), aluminum (Al), tin (Sn), nickel (Ni), titanium (Ti), palladium (Pd), chromium (Cr), iron (Fe), cobalt (Co), zirconium (Zr), platinum (Pt), vanadium (V), niobium (Nb), iridium (Ir), osmium (Os), tantalum (Ta), molybdenum (Mo), tungsten (W), and any combination of any of these. In some non-limiting examples, the element may comprise Cu, Ag, Au, and any combination of any of these. In some non-limiting examples, the element may be Cu. In some non-limiting examples, the element may be Al. In some non-limiting examples, the element may comprise Sn, Ti, Pd, Cr, Fe, Co, and any combination of any of these. In some non-limiting examples, the element may comprise Ni, Zr, Pt, V, Nb, Ir, Os, and any combination of any of these. In some non-limiting examples, the element may comprise Ta, Mo, W, and any combination of any of these. In some non-limiting examples, the element may comprise Mg, Ag, Al, and any combination of any of these. In some non-limiting examples, the element may comprise Mg, Ag, and any combination of any of these. In some non-limiting examples, the element may be Ag. In some non-limiting examples, at least one of the plurality of layers may comprise a metal having a work function that is less than about 4 eV.

(93) In some non-limiting examples, the conductive coating may be comprised of a conductive coating material In some non-limiting examples, the conductive coating material may comprise a metal having a bond dissociation energy in a diatomic molecule thereof at 298K of less than 300 kJ/mol, less than 200 kJ/mol, less than 165 kJ/mol, less than 150 kJ/mol, less than 100 kJ/mol, less than 50 kJ/mol, and less than 20 kJ/mol.

(94) In some non-limiting examples, the conductive coating material may comprise an element selected from potassium (K), sodium (Na), lithium (Li), barium (Ba), cesium (Cs), ytterbium (Yb), silver (Ag), gold (Au), copper (Cu), aluminum (Al), magnesium (Mg), zinc (Zn), cadmium (Cd), tin (Sn), yttrium (Y), and any combination of any of these. In some non-limiting examples, the element may be selected from K, Na, Li, Ba, Cs, Yb, Ag, Au, Cu, Al, Mg, and any combination of any of these. In some non-limiting examples, the element may be selected from Cu, Ag, Au, and any combination of these. In some non-limiting examples, the element may be Cu. In some non-limiting examples, the element may be Al. In some non-limiting examples, the element may be selected from Mg, Zn, Cd, Yb, and any combination of any of these. In some non-limiting examples, the element may be selected from Mg, Ag, Al, Yb, Li, and any combination of any of these. In some non-limiting examples, the element may be selected from Mg, Ag, Yb, and any combination of any of these. In some non-limiting examples, the element may be selected from Mg, Ag, and any combination of any of these. In some non-limiting examples, the element may be Ag.

(95) In some non-limiting examples, the conductive coating material may comprise a pure metal. In some non-limiting examples, the pure metal may be at least one of pure silver (Ag), and substantially pure Ag. In some non-limiting examples, the substantially pure Ag may have a purity of at least one of at least about 95%, at least about 98%, at least about 99%, at least about 99.9%, at least about 99.99%, at least about 99.999%, and at least about 99.9995%. In some non-limiting examples, the pure metal may be at least one of pure magnesium (Mg), and substantially pure Mg. IN some non-limiting examples, the substantially pure Mg may have a purity of at least one of at least about 95%, at least about 98%, at least about 99%, at least about 99.9%, at least about

99.99%, at least about 99.999%, and at least about 99.9995%.
(96) In some non-limiting examples, the conductive coating may comprise an alloy. In some non-limiting examples, the alloy may be at least one of a silver (Ag) containing alloy, a magnesium (Mg) containing alloy, and an AgMg-containing alloy.
(97) In some non-limiting examples, the conductive coating may comprise a non-metallic element. In some non-limiting examples, the non-metallic element may be selected from at least one of oxygen (O), sulfur (S), nitrogen (N), carbon (C), and any combination of any of these. In some non-limiting examples, a concentration of the non-metallic element in the conductive coating material may be less than at least one of about 1%, about 0.1%, about 0.01%, about 0.001%, about 0.0001%, about 0.00001%, about 0.000001%, and about 0.0000001%.
(98) In some non-limiting examples, the device may further comprise a semiconducting layer, wherein the at least one electrode coating extends between the semiconducting layer and the first CPL in the first emissive region and between the semiconducting layer and the second CPL in the second emissive region. In some non-limiting examples, at least one of the first CPL and the second CPL may comprise a nucleation inhibiting coating (NIC) for patterning the conductive coating.
(99) In some non-limiting examples, the second CPL may be disposed in the first emissive region. In some non-limiting examples, the first CPL may extend between the at least one electrode coating and the second CPL in the first emissive region. In some non-limiting examples, the second CPL may extend between the at least one electrode coating and the first CPL in the first emissive region.
(100) In some non-limiting examples, the first CPL may be disposed in the second emissive region. In some non-limiting examples, the first CPL may extend between the at least one electrode coating and the second CPL in the second emissive region. In some non-limiting examples, the second CPL may extend between the at least one electrode coating and the first CPL in the second emissive region.
(101) In some non-limiting examples, the device may further comprise a third emissive region configured to emit photons having a third wavelength spectrum that is characterized by a third onset wavelength. In some non-limiting examples, the third wavelength spectrum may have a third peak wavelength that is shorter than a second peak wavelength of the second wavelength spectrum and longer than a first peak wavelength of the first wavelength spectrum. In some non-limiting examples, the first wavelength spectrum may correspond to a colour that is B(lue), the second wavelength spectrum may correspond to a colour that is G(reen), and the third wavelength spectrum may correspond to a colour that is R(ed).
(102) In some non-limiting examples, at least one of the first CPL and the second CPL may be disposed in the third emissive region. In some non-limiting examples, a third CPL may be disposed in the third emissive region. In some non-limiting examples, at least one of the third CPL and the third CPL material (CPL(m)3) may exhibit a third absorption edge at a third absorption edge wavelength that is shorter than the third onset wavelength.
(103) In some non-limiting examples, the third absorption edge may be characterized by a third extinction wavelength at which an extinction coefficient of the CPL(m)3 equals a threshold value.
(104) In some non-limiting examples, the third onset wavelength may be longer than the absorption edge wavelength by less than at least one of about 200 nm, about 150 nm, about 130 nm, about 100 nm, about 80 nm, about 70 nm, about 60 nm, about 50 nm, about 40 nm, about 35 nm, about 25 nm, about 20 nm, about 15 nm, and about 10 nm. In some non-limiting examples, the third extinction wavelength is a longest one of at least one wavelength at which the extinction coefficient of the CPL(m)3 equals the threshold value. In some non-limiting examples, a first derivative of the extinction coefficient of the CPL(m)3 as a function of wavelength may be negative at the third extinction wavelength. IN some non-limiting examples, the extinction coefficient of the CPL(m)3 at a wavelength longer than the third extinction wavelength may be less than the threshold value. In some non-limiting examples, the extinction coefficient of the CPL(m)3 at all wavelengths longer

than the third extinction wavelength may be less than the threshold value. In some non-limiting examples, the extinction coefficient of the CPL(m)3 at any wavelength longer than the third onset wavelength may be less than at least one of about 0.1, about 0.09, about 0.08, about 0.06, about 0.05, about 0.03, about 0.01, about 0.005, and about 0.0001. In some non-limiting examples, the extinction coefficient of the CPL(m)3 at a wavelength shorter than the first absorption edge wavelength may exceed at least one of about 0.1, about 0.12, about 0.13, about 0.15, about 0.18, about 0.2, about 0.25, about 0.3, about 0.5, about 0.7, about 0.75, about 0.8, about 0.9, and about 1.0.

(105) In some non-limiting examples, a refractive index of the CPL(m)3 for at least one wavelength longer than the third absorption edge wavelength may exceed the refractive index of the CPL(m)3 for at least one wavelength shorter than the first absorption edge wavelength. In some non-limiting examples, the refractive index of the CPL(m)3 in at least one wavelength in the third wavelength spectrum may exceed at least one of about 1.8, about 1.9, about 1.95, about 2, about 2.05, about 2.1, about 2.2, about 2.3, and about 2.5.

(106) In some non-limiting examples, the third emissive region may be substantially devoid of at least one of the first CPL and the second CPL.

(107) Examples have been described above in conjunctions with aspects of the present disclosure upon which they can be implemented. Those skilled in the art will appreciate that examples may be implemented in conjunction with the aspect with which they are described, but may also be implemented with other examples of that or another aspect. When examples are mutually exclusive, or are otherwise incompatible with each other, it will be apparent to those having ordinary skill in the relevant art. Some examples may be described in relation to one aspect, but may also be applicable to other aspects, as will be apparent to those having ordinary skill in the relevant art.

(108) Some aspects or examples of the present disclosure may provide an opto-electronic device having first and second emissive regions having respective emission spectra on which are deposited respective capping layers (CPLs), an optical property of which may be selected to modify at least one optical microcavity effect of the underlying emissive region The CPLs may comprise a patterning coating having an initial sticking probability for forming a conductive coating on a surface thereof that is substantially less than the initial sticking probability for forming the conductive coating on an underlying surface, such that the CPL is substantially devoid of a subsequently deposited conductive coating.

Description

(109) Opto-Electronic Device

(110) The present disclosure relates generally to electronic devices, and more specifically, to opto-electronic devices. An opto-electronic device generally encompasses any device that converts electrical signals into photons and vice versa.

(111) In the present disclosure, the terms “photon” and “light” may be used interchangeably to refer to similar concepts. In the present disclosure, photons may have a wavelength that lies in the visible light spectrum, in the infrared (IR) and/or ultraviolet (UV) region thereof.

(112) In the present disclosure, the term “visible light spectrum” as used herein, generally refers to at least one wavelength in the visible part of the electromagnetic spectrum. In some non-limiting examples, the visible light spectrum may correspond to a wavelength range of about 380 nm to about 750 nm.

(113) In the present disclosure, the term “emission spectrum” (ES) as used herein, and as shown by way of non-limiting example in FIG. **32** as a plot of intensity (I) as a function of wavelength (λ), generally refers to an electroluminescence spectrum of light emitted by an opto-electronic device. By way of non-limiting example, an emission spectrum (ES) may be detected using an optical instrument, such as, by way of non-limiting example, a spectrophotometer, which measure an intensity (I) of electromagnetic radiation across a wavelength range.

(114) In the present disclosure, the term “onset wavelength” λ.sub.onset, as used herein, and as shown by way of non-limiting example in FIG. **32**, generally refers to a shortest wavelength at which an emission is detected within an emission spectrum.
(115) In the present disclosure, the term “peak wavelength” λ.sub.max, as used herein, and as shown by way of non-limiting example in FIG. **32**, generally refers to a wavelength at which the maximum luminance is detected within an emission spectrum. Those having ordinary skill in the relevant art will appreciate that luminance may be measured in units of candelas (cd) (a measure of luminous intensity per square area), in units of cd/m.sup.2 or nits. In some non-limiting examples of opto-electronic devices in which the emission spectrum varies with viewing angle (i.e. the angle at which the emission spectrum is measured), the emission spectrum taken at a normal angle to a plane of the device may be used for determining various characteristics of the emission, including without limitation, the maximum luminance and/or peak wavelength λ.sub.max thereof.
(116) In general, the onset wavelength λ.sub.onset occurs at a shorter wavelength than the peak wavelength λ.sub.max. In some non-limiting examples, the onset wavelength λ.sub.onset may correspond to a wavelength within the emission spectrum at which the luminance is at a threshold intensity (I.sub.onset), as shown generally by way of non-limiting example in FIG. **32**, which in some non-limiting examples, may be at about 10%, about 5%, about 3%, about 1%, about 0.5%, about 0.1%, or about 0.01%, of the luminance at the peak wavelength Amax.
(117) In general, electro-luminescent devices are configured to emit and/or transmit light having wavelengths in a range from about 425 nm to about 725 nm, and more specifically, in some non-limiting examples, light having peak emission wavelengths of 456 nm, 528 nm, and 624 nm, corresponding to B(lue) **2543**, G(reen) **2542**, and R(ed) **2541** sub-pixels, respectively. Accordingly, in the context of such electro-luminescent devices, the emission spectrum may to any wavelengths or wavelength ranges from about 425 nm to about 725 nm, or from about 456 nm to about 624 nm. Photons having a wavelength in the visible light spectrum may, in some non-limiting examples, also be referred to as “visible light” herein.
(118) In some non-limiting examples, an emission spectrum that lies in the R(ed) portion of the visible light spectrum may be characterized by a peak wavelength λ.sub.max that may lie in a wavelength range of 600 nm to about 640 nm and in some non-limiting examples, may be substantially about 620 nm. The corresponding onset wavelength λ.sub.onset may lie in a wavelength range of about 500 nm to about 610 nm, about 575 nm to about 600 nm, about 570 nm to about 580 nm, or about 580 nm to about 590 nm.
(119) In some non-limiting examples, an emission spectrum that lies in the G(reen) portion of the visible light spectrum may be characterized by a peak wavelength λ.sub.max that may lie in a wavelength range of 510 nm to about 540 nm and in some non-limiting examples, may be substantially about 530 nm. The corresponding onset wavelength λ.sub.onset may lie in a wavelength range of about 470 nm to about 520 nm, about 480 nm to about 510 nm, about 480 nm to about 490 nm, or about 490 to about 500 nm.
(120) In some non-limiting examples, an emission spectrum that lies in the B(lue) portion of the visible light spectrum may be characterized by a peak wavelength λ.sub.max that may lie in a wavelength range of 450 nm to about 460 nm and in some non-limiting examples, may be substantially about 455 nm. The corresponding onset wavelength λ.sub.onset may lie in a wavelength range of about 420 nm to about 450 nm, about 425 nm to about 440 nm, about 420 nm to about 430 nm, or about 430 nm to about 440 nm.
(121) In the present disclosure, the term “IR signal” as used herein, generally refers to EM radiation having a wavelength in an IR portion of the EM spectrum. An IR signal may, in some non-limiting examples, have a wavelength corresponding to a near-infrared (NIR) subset thereof. By way of non-limiting examples, an NIR signal may have a wavelength of about 750 nm to about 1400 nm, about 750 nm to about 1300 nm, about 800 nm to about 1300 nm, about 800 nm to about 1200 nm, about 850 nm to about 1100 nm, and/or about 900 nm to about 1000 nm.

(122) In the present disclosure, the term “absorption spectrum”, as used herein, generally refers a wavelength (sub-)range of the EM spectrum over which absorption occurs.
(123) In the present disclosure, the term “extinction coefficient” (k) as used herein, and as shown generally by way of non-limiting example in FIG. **33**, refers to the degree to which an electromagnetic coefficient is attenuated when propagating through a material. In some non-limiting examples, the extinction coefficient may be understood to correspond to the imaginary component k of a complex refractive index N. In some non-limiting examples, the extinction coefficient of a material may be measured by a variety of methods, including without limitation, by ellipsometry.
(124) In the present disclosure, the terms “refractive index” (n) and/or “index”, as used herein to describe a medium, and as shown generally by way of non-limiting example in FIG. **32**, refer to a value calculated from a ratio of the speed of light in such medium relative to the speed of light in a vacuum. In the present disclosure, particularly when used to describe the properties of substantially transparent materials, including without limitation, thin film layers and/or coatings, the terms may correspond to the real part, n, in the expression N=n+ik, in which N represents the complex refractive index and k represents the extinction coefficient.
(125) As would be appreciated by those having ordinary skill in the relevant art, substantially transparent materials, including without limitation, thin film layers and/or coatings, generally exhibit a relatively low k value in the visible light spectrum, and therefore the imaginary component of the expression may have a negligible contribution to the complex refractive index, N. On the other hand, light-transmissive electrodes formed, for example, by a metallic thin film, may exhibit a relatively low n value and a relatively high k value in the visible light spectrum. Accordingly, the complex refractive index, N, of such thin films may be dictated primarily by its imaginary component.
(126) In the present disclosure, unless the context dictates otherwise, reference without specificity to a refractive index is intended to be a reference to the real part n of the complex refractive index N.
(127) In the present disclosure, the terms “absorption edge” (AE), “absorption discontinuity” and/or “absorption limit” as used herein, and as shown by way of non-limiting example in FIG. **33**, generally refers to a rapid decrease in the extinction coefficient k and/or absorption spectrum of a coating, layer, and/or material. In the present disclosure, the “absorption edge” as described, for example, in relation to a capping layer (CPL) **3610**, refers to the longest wavelength, for example, within the visible spectrum, at which a rapid decrease in the extinction coefficient k of the CPL **3610** is observed. In some non-limiting examples, the extinction coefficient k of a CPL **3610**, particularly in the visible spectrum, may diminish toward zero, and remain low across the remainder of the visible spectrum. In such non-limiting examples, the absorption edge of a CPL **3610** may correspond to the wavelength, or the longest wavelength, at which the extinction coefficient k passes a threshold value T.sub.AE, as shown generally by way of non-limiting example in FIG. **33**, as it diminishes towards zero. In some non-limiting examples, the absorption edge of a CPL **3610** may correspond to the wavelength, or the longest wavelength, at which the extinction coefficient k passes the threshold value T.sub.AE with a first derivative of the extinction coefficient k as a function of wavelength λ that is negative.
(128) In some non-limiting examples, there may be a generally positive correlation between refractive index n and transmittance, or in other words, a generally negative correlation between refractive index n and absorption at or near the absorption edge. In some non-limiting examples, the absorption edge of a substance may correspond to a wavelength at which the extinction coefficient k approaches a threshold value near 0.
(129) An organic opto-electronic device can encompass any opto-electronic device where one or more active layers and/or strata thereof are formed primarily of an organic (carbon-containing) material, and more specifically, an organic semiconductor material.

(130) In the present disclosure, it will be appreciated by those having ordinary skill in the relevant art that an organic material, may comprise, without limitation, a wide variety of organic molecules, and/or organic polymers. Further, it will be appreciated by those having ordinary skill in the relevant art that organic materials that are doped with various inorganic substances, including without limitation, elements and/or inorganic compounds, may still be considered to be organic materials. Still further, it will be appreciated by those having ordinary skill in the relevant art that various organic materials may be used, and that the processes described herein are generally applicable to an entire range of such organic materials. Still further, it will be appreciated by those having ordinary skill in the relevant art that organic materials that contain metals and/or other inorganic elements, may still be considered as organic materials. Still further, it will be appreciated by those having ordinary skill in the relevant art that various organic materials may be molecules, oligomers, and/or polymers.
(131) In the present disclosure, an inorganic substance may refer to a substance that primarily includes an inorganic material. In the present disclosure, an inorganic material may comprise any material that is not considered to be an organic material, including without limitation, metals, glasses and/or minerals.
(132) Where the opto-electronic device emits photons through a luminescent process, the device may be considered an electro-luminescent device. In some non-limiting examples, the electro-luminescent device may be an organic light-emitting diode (OLED) device. In some non-limiting examples, the electro-luminescent device may be part of an electronic device. By way of non-limiting example, the electro-luminescent device may be an OLED lighting panel or module, and/or an OLED display or module of a computing device, such as a smartphone, a tablet, a laptop, an e-reader, and/or of some other electronic device such as a monitor and/or a television set (collectively “user device”).
(133) In some non-limiting examples, the opto-electronic device may be an organic photo-voltaic (OPV) device that converts photons into electricity. In some non-limiting examples, the opto-electronic device may be an electro-luminescent quantum dot device. In the present disclosure, unless specifically indicated to the contrary, reference will be made to OLED devices, with the understanding that such disclosure could, in some examples, equally be made applicable to other opto-electronic devices, including without limitation, an OPV and/or quantum dot device in a manner apparent to those having ordinary skill in the relevant art.
(134) The structure of such devices will be described from each of two aspects, namely from a cross-sectional aspect and/or from a lateral (plan view) aspect.
(135) In the present disclosure, the terms “layer” and “strata” may be used interchangeably to refer to similar concepts.
(136) In the context of introducing the cross-sectional aspect below, the components of such devices are shown in substantially planar lateral strata. Those having ordinary skill in the relevant art will appreciate that such substantially planar representation is for purposes of illustration only, and that across a lateral extent of such a device, there may be localized substantially planar strata of different thicknesses and dimension, including, in some non-limiting examples, the substantially complete absence of a layer, and/or layer(s) separated by non-planar transition regions (including lateral gaps and even discontinuities). Thus, while for illustrative purposes, the device is shown below in its cross-sectional aspect as a substantially stratified structure, in the plan view aspect discussed below, such device may illustrate a diverse topography to define features, each of which may substantially exhibit the stratified profile discussed in the cross-sectional aspect.
(137) Cross-Sectional Aspect
(138) FIG. **1** is a simplified block diagram from a cross-sectional aspect, of an example electro-luminescent device according to the present disclosure. The electro-luminescent device, shown generally at **100** comprises a plurality of layers, including without limitation, a substrate **110**, upon which a frontplane **10**, comprising a plurality of layers, respectively, a first electrode **120**, at least

one semiconducting layer **130**, and a second electrode **140**, are disposed. In some non-limiting examples, the frontplane **10** may provide mechanisms for photon emission and/or manipulation of emitted photons. In some non-limiting examples, a barrier coating **1650** (FIG. **16**C) may be provided to surround and/or encapsulate the layers **120**, **130**, **140** and/or the substrate **110** disposed thereon.

(139) For purposes of illustration, an exposed layer surface of underlying material is referred to as **111**. In FIG. **1**, the exposed layer surface **111** is shown as being of the second electrode **140**. Those having ordinary skill in the relevant art will appreciate that, at the time of deposition of, by way of non-limiting example, the first electrode **120**, the exposed layer surface **111** would have been shown as **111***a*, of the substrate **110**.

(140) Those having ordinary skill in the relevant art will appreciate that when a component, a layer, a region and/or portion thereof is referred to as being "formed", "disposed" and/or "deposited" on and/or over another underlying material, component, layer, region and/or portion, such formation, disposition and/or deposition may be directly and/or indirectly on an exposed layer surface **111** (at the time of such formation, disposition and/or deposition) of such underlying material, component, layer, region and/or portion, with the potential of intervening material(s), component(s), layer(s), region(s) and/or portion(s) therebetween.

(141) In the present disclosure, a directional convention is followed, extending substantially normally relative to the lateral aspect described above, in which the substrate **110** is considered to be the "bottom" of the device **100**, and the layers **120**, **130**, **140** are disposed on "top" of the substrate **11**. Following such convention, the second electrode **140** is at the top of the device **100** shown, even if (as may be the case in some examples, including without limitation, during a manufacturing process, in which one or more layers **120**, **130**, **140** may be introduced by means of a vapor deposition process), the substrate **110** is physically inverted such that the top surface, on which one of the layers **120**, **130**, **140**, such as, without limitation, the first electrode **120**, is to be disposed, is physically below the substrate **110**, so as to allow the deposition material (not shown) to move upward and be deposited upon the top surface thereof as a thin film.

(142) In some non-limiting examples, the device **100** may be electrically coupled to a power source **15**. When so coupled, the device **100** may emit photons as described herein.

(143) In some non-limiting examples, the device **100** may be classified according to a direction of emission of photons generated therefrom. In some non-limiting examples, the device **100** may be considered to be a bottom-emission device if the photons generated are emitted in a direction toward and through the substrate **100** at the bottom of the device **100** and away from the layers **120**, **130**, **140** disposed on top of the substrate **110**. In some non-limiting examples, the device **100** may be considered to be a top-emission device if the photons are emitted in a direction away from the substrate **110** at the bottom of the device **100** and toward and/or through the top layer **140** disposed, with intermediate layers **120**, **130**, on top of the substrate **110**. In some non-limiting examples, the device **100** may be considered to be a double-sided emission device if it is configured to emit photons in both the bottom (toward and through the substrate **110**) and top (toward and through the top layer **140**).

(144) Thin Film Formation

(145) The frontplane **10** layers **120**, **130**, **140** may be disposed in turn on a target exposed layer surface **111** (and/or, in some non-limiting examples, including without limitation, in the case of selective deposition disclosed herein, at least one target region and/or portion of such surface) of an underlying material, which in some non-limiting examples, may be, from time to time, the substrate **110** and intervening lower layers **120**, **130**, **140**, as a thin film. In some non-limiting examples, an electrode **120**, **140**, **1750**, **4150** may be formed of at least one thin conductive film layer of a conductive coating **830** (FIG. **8**). It will be understood by those having ordinary skill in the relevant art that such conductive coating **830** may be (at least) one of the plurality of layers of the device **100**. The conductive coating **830** may be comprised of a conductive coating material

831. Those having ordinary skill in the relevant art will appreciate that the conductive coating **830** and the conductive coating material **831** of which it is comprised, especially when disposed as a film and under conditions and/or by mechanisms substantially similar to those employed in depositing the conductive coating **830**, may exhibit largely similar optical and/or other properties.
(146) The thickness of each layer, including without limitation, layers **120**, **130**, **140**, and of the substrate **110**, shown in FIG. **1**, and throughout the figures, is illustrative only and not necessarily representative of a thickness relative to another layer **120**, **130**, **140** (and/or of the substrate **110**).
(147) In the present disclosure, for purposes of simplicity of description, the terms “coating film”, “closed coating”, and/or “closed film” **4530**, as used herein, refer to a thin film structure and/or coating of, in some non-limiting examples, a conductive coating material **831** used for a conductive coating **830**, in which a relevant portion of a surface is substantially coated thereby, such that such surface is not substantially exposed by or through the closed film **4530** deposited thereon.
(148) In the present disclosure, unless the context dictates otherwise, reference without specificity to a thin film is intended to be a reference to a substantially closed film **4530**.
(149) In some non-limiting examples, a closed film **4530**, in some non-limiting examples, of a conductive coating material **831**, may be disposed to cover a portion of an underlying surface, such that, within such portion, less than about 20%, less than about 15%, less than about 10%, less than about 5%, less than about 3%, or less than about 1% of the underlying surface therewithin is exposed by or through the closed film **4530**.
(150) Those having ordinary skill in the relevant art will appreciate that a closed film **4530** may be patterned using various techniques and processes, including without limitation, those described herein, so as to deliberately leave a part of the exposed layer surface **111** of the underlying surface to be exposed after deposition of the closed film **4530**. In the present disclosure, such patterned films may nevertheless be considered to constitute a closed film **4530**, if, by way of non-limiting example, the thin film and/or coating that is deposited, within the context of such patterning, and between such deliberately exposed parts of the exposed layer surface **111** of the underlying surface, itself substantially comprises a closed film **4530**.
(151) Those having ordinary skill in the relevant art will appreciate that due to the inherent variability in the deposition process, and in some non-limiting examples, to the existence of impurities in either or both of the deposited materials, in some non-limiting examples, the conductive coating material **831**, and the exposed layer surface **111** of the underlying material, deposition of a thin film, using various techniques and processes, including without limitation, those described herein, may nevertheless result in the formation of small apertures, including without limitation, pin-holes, tears, and/or cracks, therein. In the present disclosure, such thin films may nevertheless be considered to constitute a closed film **4530**, if, by way of non-limiting example, the thin film and/or coating that is deposited substantially comprises a closed film **4530** and meets the percentage coverage criterion set out above, despite the presence of such apertures.
(152) With continued vapor deposition of monomers (which in some non-limiting examples may be molecules and/or atoms of a deposited material in vapor form) a substantially closed film **4530** may eventually be deposited on an exposed layer surface **111** of an underlying material. The behaviour, including optical effects caused thereby, of such closed films **4530** are generally relatively consistent and unsurprising.
(153) In some non-limiting examples, the behaviour, including optical effects thereof, of thin films that comprise at least one closed film **4530** are generally relatively uniform.
(154) While the present disclosure discusses thin film formation, in reference to at least one layer or coating, in terms of vapor deposition, those having ordinary skill in the relevant art will appreciate that, in some non-limiting examples, various components of the electro-luminescent device **100** may be selectively deposited using a wide variety of techniques, including without limitation, evaporation (including without limitation, thermal evaporation and/or electron beam evaporation), photolithography, printing (including without limitation, ink jet and/or vapor jet

printing, reel-to-reel printing and/or micro-contact transfer printing), physical vapor deposition (PVD) (including without limitation, sputtering), chemical vapor deposition (CVD) (including without limitation, plasma-enhanced CVD (PECVD) and/or organic vapor phase deposition (OVPD)), laser annealing, laser-induced thermal imaging (LITI) patterning, atomic-layer deposition (ALD), coating (including without limitation, spin coating, dip coating, line coating and/or spray coating) and/or combinations thereof. Some processes may be used in combination with a shadow mask, which may, in some non-limiting examples, be an open mask and/or fine metal mask (FMM), during deposition of any of various layers and/or coatings to achieve various patterns by masking and/or precluding deposition of a deposited material on certain parts of a surface of an underlying material exposed thereto.

(155) In the present disclosure, the terms "evaporation" and/or "sublimation" may be used interchangeably to refer generally to deposition processes in which a source material is converted into a vapor, including without limitation by heating, to be deposited onto a target surface in, without limitation, a solid state. As will be understood, an evaporation process is a type of PVD process where one or more source materials are evaporated and/or sublimed under a low pressure (including without limitation, a vacuum) environment to form vapor monomers and deposited on a target surface through de-sublimation of the one or more evaporated source materials. A variety of different evaporation sources may be used for heating a source material, and, as such, it will be appreciated by those having ordinary skill in the relevant art, that the source material may be heated in various ways. By way of non-limiting example, the source material may be heated by an electric filament, electron beam, inductive heating, and/or by resistive heating. In some non-limiting examples, the source material may be loaded into a heated crucible, a heated boat, a Knudsen cell (which may be an effusion evaporator source) and/or any other type of evaporation source.

(156) In some non-limiting examples, a deposition source material may be a mixture. In some non-limiting examples, at least one component of a mixture of a deposition source material may not be deposited during the deposition process (or, in some non-limiting examples, be deposited in a relatively small amount compared to other components of such mixture).

(157) In the present disclosure, a reference to a layer thickness of a material, irrespective of the mechanism of deposition thereof, refers to an amount of the material deposited on a target exposed layer surface **111**, which corresponds to an amount of the material to cover the target surface with a uniformly thick layer of the material having the referenced layer thickness. By way of non-limiting example, depositing a layer thickness of 10 nm of material indicates that an amount of the material deposited on the surface corresponds to an amount of the material to form a uniformly thick layer of the material that is 10 nm thick. It will be appreciated that, having regard to the mechanism by which thin films are formed discussed above, by way of non-limiting example, due to possible stacking or clustering of monomers (which in some non-limiting examples may be molecules and/or atoms), an actual thickness of the deposited material may be non-uniform. By way of non-limiting example, depositing a layer thickness of 10 nm may yield some parts of the deposited material having an actual thickness greater than 10 nm, or other parts of the deposited material having an actual thickness less than 10 nm. A certain layer thickness of a material deposited on a surface may thus correspond, in some non-limiting examples, to an average thickness of the deposited material across the target surface, including without limitation, as a closed film **4530**.

(158) In the present disclosure, a reference to a reference layer thickness refers to a layer thickness of the conductive coating **830**, also referred to herein as the conductive coating material **831**, that is deposited on a reference surface exhibiting a high initial sticking probability or initial sticking coefficient S.sub.0 (that is, a surface having an initial sticking probability S.sub.0 that is about and/or close to 1). The reference layer thickness does not indicate an actual thickness of the conductive coating material **831** deposited on a target surface (such as, without limitation, a surface of a nucleation-inhibiting coating (NIC) **810**).

(159) It will be understood by those having ordinary skill in the relevant art that such NIC **810** may be (at least) one of the plurality of layers of the device **100**. The NIC **810** may be comprised of an NIC material. Those having ordinary skill in the relevant art will appreciate that the NIC **810** and the NIC material of which it is comprised, especially when disposed as a film and under conditions and/or by mechanisms substantially similar to those employed in depositing the NIC **810**, may exhibit largely similar optical and/or other properties.
(160) Rather, the reference layer thickness refers to a layer thickness of the conductive coating material **831** that would be deposited on a reference surface, in some non-limiting examples, a surface of a quartz crystal positioned inside a deposition chamber for monitoring a deposition rate and the reference layer thickness, upon subjecting the target surface and the reference surface to identical vapor flux of the conductive coating material **831** for the same deposition period. Those having ordinary skill in the relevant art will appreciate that in the event that the target surface and the reference surface are not subjected to identical vapor flux simultaneously during deposition, an appropriate tooling factor may be used to determine and/or to monitor the reference layer thickness.
(161) In the present disclosure, a reference to depositing a number X of monolayers of material refers to depositing an amount of the material to cover a desired area of an exposed layer surface **111** with X single layer(s) of constituent monomers of the material, such as, without limitation, in a closed film **4530**.
(162) The formation of thin films during vapor deposition on an exposed layer surface **111** of an underlying material involves processes of nucleation and growth. During initial stages of film formation, a sufficient number of vapor monomers (which in some non-limiting examples may be molecules and/or atoms) typically condense from a vapor phase to form initial nuclei on the exposed layer surface **111** presented, whether of the substrate **110** (or of an intervening lower layer **120**, **130**, **140**). As vapor monomers continue to impinge on such surface, a size and density of these initial nuclei increase to form small clusters or islands. After reaching a saturation island density, adjacent islands typically will start to coalesce, increasing an average island size, while decreasing an island density. Coalescence of adjacent islands may continue until a substantially closed film **4530** is formed.
(163) However, prior to the formation of a substantially closed film **4530**, the deposition of vapor monomers may result in thin film structures, described herein, which may exhibit one or more varied characteristics and concomitantly, varied behaviours, including without limitation, optical effects.
(164) In the present disclosure, a reference to depositing a fraction 0.X monolayer of a material refers to depositing an amount of the material to cover a fraction 0.X of a desired area of a surface with a single layer of constituent monomers of the material. Those having ordinary skill in the relevant art will appreciate that due to, by way of non-limiting example, possible stacking and/or clustering of monomers, an actual local thickness of a deposited material across a desired area of a surface may be non-uniform. By way of non-limiting example, depositing 1 monolayer of a material may result in some local regions of the desired area of the surface being uncovered by the material, while other local regions of the desired area of the surface may have multiple atomic and/or molecular layers deposited thereon.
(165) In the present disclosure, a target surface (and/or target region(s) thereof) may be considered to be “substantially devoid of”, “substantially free of”, and/or “substantially uncovered by” a material if there is a substantial absence of the material on the target surface as determined by any suitable determination mechanism.
(166) In the present disclosure, for purposes of simplicity of description, the result of deposition of vapor monomers onto an exposed layer surface **111** of an underlying material, that has not (yet) reached a stage where a closed film **4530** has been formed, will be referred to as a “clustering layer”. In some non-limiting examples, such a clustering layer may reflect that the deposition process has not been completed, in which such a clustering layer may be considered as an interim

stage of formation of a closed film **4530**. In some non-limiting examples, a clustering layer may be the result of a completed deposition process, and thus constitute a final stage of formation in and of itself.
(167) In the present disclosure, for purposes of simplicity of description, the term “discontinuous coating” **1050** as used herein, refers to a clustering layer, in which a relevant portion of the exposed layer surface **111** of an underlying material coated by the deposition process, is neither substantially devoid of such material, nor forms a closed film **4530** thereof. In some non-limiting examples, a discontinuous coating **1050** of a conductive coating material **831** may manifest as a plurality of discrete islands deposited on such surface.
(168) In the present disclosure, for purposes of simplicity of description, the term “dendritic”, with respect to a coating, including without limitation, the conductive coating **830**, refers to feature(s) that resemble a branched structure when viewed in a lateral aspect. In some non-limiting examples, the conductive coating **830** may comprise a dendritic projection **1021** and/or a dendritic recess **1022**. In some non-limiting examples, a dendritic projection **1021** may correspond to a part of the conductive coating **830** that exhibits a branched structure comprising a plurality of short projections that are physically connected and extend substantially outwardly. In some non-limiting examples, a dendritic recess **1022** may correspond to a branched structure of gaps, openings, and/or uncovered parts of the conductive coating **830** that are physically connected and extend substantially outwardly. In some non-limiting examples, a dendritic recess **1022** may correspond to, including without limitation, a mirror image and/or inverse pattern, to the pattern of a dendritic projection **1021**. In some non-limiting examples, a dendritic projection **1021** and/or a dendritic recess **1022** may have a configuration that exhibits, and/or mimics a fractal pattern, a mesh, a web, and/or an interdigitated structure.
(169) In some non-limiting examples, there may be a clustering layer that reflects an intermediate stage in the deposition of vapor monomers, beyond formation of a discontinuous coating **1050**, but prior to formation of a closed film **4530**, in which continued coalescence of clusters and/or islands **5001**, **5002** continues until the number of clusters and/or islands **5001**, **5002** remaining approaches zero. Where such an intermediate stage clustering layer is reached, the deposited monomers may in some non-limiting examples form an intermediate stage thin film that may comprise a fraction 0.X of a single monolayer, such that it is not a closed film **4530**, in that there may be apertures and/or gaps in the film coverage, including without limitation, one or more dendritic projections **1021**, and/or one or more dendritic recesses **1022**, yet remains substantially conductive.
(170) There may be at least three basic growth modes for the formation of thin films, initially as clustering layers and, in some non-limiting examples, culminating in a closed film **4530**: 1) island (Volmer-Weber), 2) layer-by-layer (Frank-van der Merwe), and 3) Stranski-Krastanov.
(171) In the present disclosure, the terms “island” and “cluster” may be used interchangeably to refer to similar concepts.
(172) Island growth typically occurs when stale clusters of monomers nucleate on a surface and grow to form discrete islands. This growth mode occurs when the interactions between the monomers is stronger than that between the monomers and the surface.
(173) The nucleation rate describes how many nuclei of a given size (where the free energy does not push a cluster of such nuclei to either grow or shrink) (“critical nuclei”) form on a surface per unit time. During initial stages of film formation, it is unlikely that nuclei will grow from direct impingement of monomers on the surface, since the density of nuclei is low, and thus the nuclei cover a relatively small fraction of the surface (e.g. there are large gaps/spaces between neighboring nuclei). Therefore, the rate at which critical nuclei grow typically depends on the rate at which adatoms (e.g. adsorbed monomers) on the surface migrate and attach to nearby nuclei.
(174) An example of an energy profile of an adatom adsorbed onto an exposed layer surface **111** of an underlying material (in the figure, the substrate **110**) is illustrated in FIG. **6**. Specifically, FIG. **6** illustrates example qualitative energy profiles corresponding to: an adatom escaping from a local

low energy site (**610**); diffusion of the adatom on the exposed layer surface **111** (**620**); and desorption of the adatom (**630**).

(175) In **610**, the local low energy site may be any site on the exposed layer surface **111** of an underlying material, onto which an adatom will be at a lower energy. Typically, the nucleation site may comprise a defect and/or an anomaly on the exposed layer surface **111**, including without limitation, a step edge, a chemical impurity, a bonding site and/or a kink. Once the adatom is trapped at the local low energy site, there may in some non-limiting examples, typically be an energy barrier before surface diffusion takes place. Such energy barrier is represented as ΔE **611** in FIG. **6**. In some non-limiting examples, if the energy barrier ΔE **611** to escape the local low energy site is sufficiently large the site may act as a nucleation site.

(176) In **620**, the adatom may diffuse on the exposed layer surface **111**. By way of non-limiting example, in the case of localized absorbates, adatoms tend to oscillate near a minimum of the surface potential and migrate to various neighboring sites until the adatom is either desorbed, and/or is incorporated into a growing film and/or growing islands formed by a cluster **5001**, **5002** of adatoms. In FIG. **6**, the activation energy associated with surface diffusion of adatoms is represented as E.sub.s **621**.

(177) In **630**, the activation energy associated with desorption of the adatom from the surface is represented as E.sub.des **631**. Those having ordinary skill in the relevant art will appreciate that any adatoms that are not desorbed may remain on the exposed layer surface **111**. By way of non-limiting example, such adatoms may diffuse on the exposed layer surface **111**, be incorporated as part of a growing film and/or coating, and/or become part of a cluster **5001**, **5002** of adatoms that form islands on the exposed layer surface **111**.

(178) After adsorption of an adatom on a surface, the adatom may either desorb from the surface, or may migrate some distance on the surface before either desorbing, interacting with other adatoms to form a small cluster, or attaching to a growing nucleus. An average amount of time that an adatom remains on the surface after initial adsorption is given by:

(179) $\tau_s = \frac{1}{\upsilon}\exp(\frac{E_{\text{des}}}{\text{kT}})$

(180) In the above equation, v is a vibrational frequency of the adatom on the surface, k is the Botzmann constant, T is temperature, and E.sub.des **631** is an energy involved to desorb the adatom from the surface. From this equation it is noted that the lower the value of E.sub.des **631** the easier it is for the adatom to desorb from the surface, and hence the shorter the time the adatom will remain on the surface. A mean distance an adatom can diffuse is given by,

(181) $X = a_0 \exp(\frac{E_{\text{des}} - E_s}{2\text{kT}})$

where a.sub.0 is a lattice constant and E.sub.s **621** is an activation energy for surface diffusion. For low values of E.sub.des **631** and/or high values of E.sub.s **621**, the adatom will diffuse a shorter distance before desorbing, and hence is less likely to attach to growing nuclei or interact with another adatom or cluster of adatoms.

(182) During initial stages of film formation, adsorbed adatoms may interact to form clusters, with a critical concentration of clusters per unit area being given by,

(183) $\frac{N_i}{n_0} = \text{.Math.} \frac{N_1}{n_0} \text{.Math.}^{i} \exp(\frac{E_i}{\text{kT}})$

where E.sub.i is an energy involved to dissociate a critical cluster containing i adatoms into separate adatoms, n.sub.0 is a total density of adsorption sites, and N.sub.1 is a monomer density given by:

N.sub.1=*{dot over (R)}τ*.sub.s

where {dot over (R)} is a vapor impingement rate. Typically i will depend on a crystal structure of a material being deposited and will determine the critical cluster size to form a stable nucleus.

(184) A critical monomer supply rate for growing clusters is given by the rate of vapor impingement and an average area over which an adatom can diffuse before desorbing:

(185) $RX^2 = \alpha_0^2 \exp(\frac{E_{\text{des}} - E_s}{kT})$

(186) The critical nucleation rate is thus given by the combination of the above equations:

(187) $N_i = R\alpha_0^2 n_0 \left(\frac{R}{\upsilon n_0}\right)^i \exp\left(\frac{(i+1)E_{\text{des}} - E_s + E_i}{kT}\right)$

(188) From the above equation it is noted that the critical nucleation rate will be suppressed for surfaces that have a low desorption energy for adsorbed adatoms, a high activation energy for diffusion of an adatom, are at high temperatures, and/or are subjected to vapor impingement rates.

(189) Sites of substrate heterogeneities, such as defects, ledges or step edges, may increase E.sub.des **631**, leading to a higher density of nuclei observed at such sites. Also, impurities or contamination on a surface may also increase E.sub.des **631**, leading to a higher density of nuclei. For vapor deposition processes, conducted under high vacuum conditions, the type and density of contaminates on a surface is affected by a vacuum pressure and a composition of residual gases that make up that pressure.

(190) Under high vacuum conditions, a flux of molecules that impinge on a surface (per cm.sup.2-sec) is given by:

(191) $\phi = 3.513 \times 10^{22} \frac{P}{MT}$

where P is pressure, and M is molecular weight. Therefore, a higher partial pressure of a reactive gas, such as H.sub.2O, can lead to a higher density of contamination on a surface during vapor deposition, leading to an increase in E.sub.des **631** and hence a higher density of nuclei.

(192) In some non-limiting examples, one measure of an amount of a material on a surface is a percentage coverage of the surface by such material. In some non-limiting examples surface coverage may be assessed using a variety of imaging techniques, including without limitation, transmission electron microscopy (TEM), atomic force microscopy (AFM) and/or scanning electron microscopy (SEM).

(193) In some non-limiting examples, one measure of an amount of an electrically conductive material on a surface is a (light) transmittance, since in some non-limiting examples, electrically conductive materials, including without limitation, metals, including without limitation silver (Ag), magnesium (Mg), and/or ytterbium (Yb), attenuate and/or absorb photons.

(194) Thus, in some non-limiting examples, a surface of a material may be considered to be substantially devoid of an electrically conductive material if the transmittance therethrough is greater than 90%, greater than 92%, greater than 95%, and/or greater than 98% of the transmittance of a reference material of similar composition and dimension of such material, in some non-limiting examples, in the visible part of the electromagnetic spectrum.

(195) In the present disclosure, for purposes of simplicity of illustration, details of deposited materials, including without limitation, thickness profiles and/or edge profiles of layer(s) have been omitted. Various possible edge profiles at an interface between NICs **810** and conductive coatings **830** are discussed herein.

(196) Substrate

(197) In some examples, the substrate **110** may comprise a base substrate **112**. In some examples, the base substrate **112** may be formed of material suitable for use thereof, including without limitation, an inorganic material, including without limitation, silicon (Si), glass, metal (including without limitation, a metal foil), sapphire, and/or other inorganic material, and/or an organic material, including without limitation, a polymer, including without limitation, a polyimide and/or a silicon-based polymer. In some examples, the base substrate **112** may be rigid or flexible. In some examples, the substrate **112** may be defined by at least one planar surface. The substrate **110** has at least one surface that supports the remaining front plane **10** components of the device **100**, including without limitation, the first electrode **120**, the at least one semiconducting layer **130** and/or the second electrode **140**.

(198) In some non-limiting examples, such surface may be an organic surface and/or an inorganic surface.

(199) In some examples, the substrate **110** may comprise, in addition to the base substrate **112**, one

or more additional organic and/or inorganic layers (not shown nor specifically described herein) supported on an exposed layer surface **111** of the base substrate **112**.
(200) In some non-limiting examples, such additional layers may comprise and/or form one or more organic layers, which may comprise, replace and/or supplement one or more of the at least one semiconducting layers **130**.
(201) In some non-limiting examples, such additional layers may comprise one or more inorganic layers, which may comprise and/or form one or more electrodes, which in some non-limiting examples, may comprise, replace and/or supplement the first electrode **120** and/or the second electrode **140**.
(202) In some non-limiting examples, such additional layers may comprise and/or be formed of and/or as a backplane layer **20** (FIG. **2**) of a semiconductor material. In some non-limiting examples, the backplane layer **20** contains power circuitry and/or switching elements for driving the device **100**, including without limitation, electronic TFT structure(s) and/or component(s) **200** (FIG. **2**) thereof that may be formed by a photolithography process, which may not be provided under, and/or may precede the introduction of low pressure (including without limitation, a vacuum) environment.
(203) In the present disclosure, a semiconductor material may be described as a material that generally exhibits a band gap. In some non-limiting examples, the band gap may be formed between a highest occupied molecular orbital (HOMO) and a lowest unoccupied molecular orbital (LUMO) of the semiconductor material. Semiconductor materials thus generally exhibit electrical conductivity that is less than that of a conductive material (including without limitation, a metal), but that is greater than that of an insulating material (including without limitation, a glass). In some non-limiting examples, the semiconductor material may comprise an organic semiconductor material. In some non-limiting examples, the semiconductor material may comprise an inorganic semiconductor material.
(204) Backplane and TFT Structure(s) Embodied Therein
(205) FIG. **2** is a simplified cross-sectional view of an example of the substrate **110** of the device **100**, including a backplane layer **20** thereof. In some non-limiting examples, the backplane **20** of the substrate **110** may comprise one or more electronic and/or opto-electronic components, including without limitation, transistors, resistors and/or capacitors, such as which may support the device **100** acting as an active-matrix and/or a passive matrix device. In some non-limiting examples, such structures may be a thin-film transistor (TFT) structure, such as is shown at **200**. In some non-limiting examples, the TFT structure **200** may be fabricated using organic and/or inorganic materials to form various layers **210**, **220**, **230**, **240**, **250**, **270**, **270**, **280** and/or parts of the backplane layer **20** of the substrate **110** above the base substrate **112**. In FIG. **2**, the TFT structure **200** shown is a top-gate TFT. In some non-limiting examples, TFT technology and/or structures, including without limitation, one or more of the layers **210**, **220**, **230**, **240**, **250**, **270**, **270**, **280**, may be employed to implement non-transistor components, including without limitation, resistors and/or capacitors.
(206) In some non-limiting examples, the backplane **20** may comprise a buffer layer **210** deposited on an exposed layer surface **111** of the base substrate **112** to support the components of the TFT structure **200**. In some non-limiting examples, the TFT structure **200** may comprise a semiconductor active area **220**, a gate insulating layer **230**, a TFT gate electrode **240**, an interlayer insulating layer **250**, a TFT source electrode **260**, a TFT drain electrode **270** and/or a TFT insulating layer **280**. In some non-limiting examples, the semiconductor active area **220** is formed over a part of the buffer layer **210**, and the gate insulating layer **230** is deposited on substantially cover the semiconductor active area **220**. In some non-limiting examples, the gate electrode **240** is formed on top of the gate insulating layer **230** and the interlayer insulating layer **250** is deposited thereon. The TFT source electrode **270** and the TFT drain electrode **270** are formed such that they extend through openings formed through both the interlayer insulating layer **250** and the gate

insulating layer **230** such that they are electrically coupled to the semiconductor active area **220**. The TFT insulating layer **280** is then formed over the TFT structure **200**.
(207) In some non-limiting examples, one or more of the layers **210**, **220**, **230**, **240**, **250**, **270**, **270**, **280** of the backplane **20** may be patterned using photolithography, which uses a photomask to expose selective parts of a photoresist covering an underlying device layer to UV light. Depending upon a type of photoresist used, exposed or unexposed parts of the photomask may then be removed to reveal desired parts of the underlying device layer. In some examples, the photoresist is a positive photoresist, in which the selective parts thereof exposed to UV light are not substantially removable thereafter, while the remaining parts not so exposed are substantially removable thereafter. In some non-limiting examples, the photoresist is a negative photoresist, in which the selective parts thereof exposed to UV light are substantially removable thereafter, while the remaining parts not so exposed are not substantially removable thereafter. A patterned surface may thus be etched, including without limitation, chemically and/or physically, and/or washed off and/or away, to effectively remove an exposed part of such layer **210**, **220**, **230**, **240**, **250**, **260**, **270**, **280**.
(208) Further, while a top-gate TFT structure **200** is shown in FIG. **2**, those having ordinary skill in the relevant art will appreciate that other TFT structures, including without limitation a bottom-gate TFT structure, may be formed in the backplane **20** without departing from the scope of the present disclosure.
(209) In some non-limiting examples, the TFT structure **200** may be an n-type TFT and/or a p-type TFT. In some non-limiting examples, the TFT structure **200** may incorporate any one or more of amorphous Si (a-Si), indium gallium zinc (Zn) oxide (IGZO) and/or low-temperature polycrystalline Si (LTPS).
(210) First Electrode
(211) The first electrode **120** is deposited over the substrate **110**. In some non-limiting examples, the first electrode **120** is electrically coupled to a terminal of the power source **15** and/or to ground. In some non-limiting examples, the first electrode **120** is so coupled through at least one driving circuit **300** (FIG. **3**), which in some non-limiting examples, may incorporate at least one TFT structure **200** in the backplane **20** of the substrate **110**.
(212) In some non-limiting examples, the first electrode **120** may comprise an anode **341** (FIG. **3**) and/or a cathode **342** (FIG. **3**). In some non-limiting examples, the first electrode **120** is an anode **341**.
(213) In some non-limiting examples, the first electrode **120** may be formed by depositing at least one thin conductive film, over (a part of) the substrate **110**. In some non-limiting examples, there may be a plurality of first electrodes **120**, disposed in a spatial arrangement over a lateral aspect of the substrate **110**. In some non-limiting examples, one or more of such at least one first electrodes **120** may be deposited over (a portion of) the TFT insulating layer **280** disposed in a lateral aspect in a spatial arrangement. If so, in some non-limiting examples, at least one of such at least one first electrodes **120** may extend through an opening of the corresponding TFT insulating layer **280**, as shown in FIG. **4**, to be electrically coupled to an electrode **240**, **260**, **270** of the TFT structure **200** in the backplane **20**. In FIG. **4**, a part of the at least one first electrode **120** is shown coupled to the TFT drain electrode **270**.
(214) In some non-limiting examples, the at least one first electrode **120** and/or at least one thin film thereof, may comprise various materials, including without limitation, one or more metallic materials, including without limitation, Mg, aluminum (Al), calcium (Ca), Zn, Ag, cadmium (Cd), barium (Ba) and/or Yb, and/or combinations of any two or more thereof, including without limitation, alloys containing any of such materials, one or more metal oxides, including without limitation, a transparent conducting oxide (TCO), including without limitation, ternary compositions such as, without limitation, fluorine tin oxide (FTO), indium zinc oxide (IZO), and/or indium tin oxide (ITO), and/or combinations of any two or more thereof and/or in varying

proportions, and/or combinations of any two or more thereof in at least one layer, any one or more of which may be, without limitation, a thin film.

(215) In some non-limiting examples, a thin conductive film comprising the first electrode **120** may be selectively deposited, deposited and/or processed using a variety of techniques, including without limitation, evaporation (including without limitation, thermal evaporation and/or electron beam evaporation), photolithography, printing (including without limitation, ink jet and/or vapor jet printing, reel-to-reel printing and/or micro-contact transfer printing), PVD (including without limitation, sputtering), CVD (including without limitation, PECVD and/or OVPD), laser annealing, LITI patterning, ALD, coating (including without limitation, spin coating, dip coating, line coating and/or spray coating), and/or combinations of any two or more thereof.

(216) Second Electrode

(217) The second electrode **140** is deposited over the at least one semiconducting layer **130**. In some non-limiting examples, the second electrode **140** is electrically coupled to a terminal of the power source **15** and/or to ground. In some non-limiting examples, the second electrode **140** is so coupled through at least one driving circuit **300**, which in some non-limiting examples, may incorporate at least one TFT structure **200** in the backplane **20** of the substrate **110**.

(218) In some non-limiting examples, the second electrode **140** may comprise an anode **341** and/or a cathode **342**. In some non-limiting examples, the second electrode **130** is a cathode **342**.

(219) In some non-limiting examples, the second electrode **140** may be formed by depositing a conductive coating **830**, in some non-limiting examples, as at least one thin film, over (a part of) the at least one semiconducting layer **130**. In some non-limiting examples, there may be a plurality of second electrodes **140**, disposed in a spatial arrangement over a lateral aspect of the at least one semiconducting layer **130**.

(220) In some non-limiting examples, sheet resistance is a property of a component, layer, and/or part that may alter a characteristic of an electric current passing through such component, layer, and/or part. In some non-limiting examples, a sheet resistance R**1** of the second electrode **140** may generally correspond to a sheet resistance of the second electrode **140** measured in isolation from other components, layers, and/or parts of the device **100**. In some non-limiting examples, the second electrode **140** may be formed as a thin film. Accordingly, in some non-limiting examples, the sheet resistance R**1** for the second electrode **140** may be determined and/or calculated based on the composition, thickness, and/or morphology of such thin film. In some non-limiting examples, the sheet resistance R**1** may be about 0.1-1,000 Ω/sqr, about 1-100 Ω/sqr, about 2-50 Ω/sqr, about 3-30 Ω/sqr, about 4-20 Ω/sqr, about 5-15 Ω/sqr, and/or about 10-12 Ω/sqr.

(221) In some non-limiting examples, the second electrode **140** may be comprised of a second electrode material.

(222) In some non-limiting examples, a bond dissociation energy of a metal may correspond to a standard-state enthalpy change measured at 298 K from the breaking of a bond of a diatomic molecule formed by two identical atoms of the metal. Bond dissociation energies may, by way of non-limiting example, be determined based on known literature, including without limitation, Luo, Yu-ran, "Bond dissociation energies" (**2010**). In some non-limiting examples, the second electrode material may comprise a metal having a bond dissociation energy of at least 10 kJ/mol, at least 50 kJ/mol, at least 100 kJ/mol, at least 150 kJ/mol, at least 180 kJ/mol, and/or at least 200 kJ/mol.

(223) In some non-limiting examples, the second electrode material may comprise a metal having an electronegativity that is less than about 1.4, about 1.3, and/or about 1.2.

(224) In some non-limiting examples, the second electrode material may comprise an element selected from potassium (K), sodium (Na), lithium (Li), barium (Ba), cesium (Cs), ytterbium (Yb), silver (Ag), gold (Au), copper (Cu), aluminum (Al), magnesium (Mg), zinc (Zn), cadmium (Cd), tin (Sn), nickel (Ni), titanium (Ti), palladium (Pd), chromium (Cr), iron (Fe), cobalt (Co), zirconium (Zr), platinum (Pt), vanadium (V), niobium (Nb), iridium (Ir), osmium (Os), tantalum (Ta), molybdenum (Mo), and/or tungsten (W). In some non-limiting examples, the element may

comprise Cu, Ag, and/or Au. In some non-limiting examples, the element may be Cu. In some non-limiting examples, the element may be Al. In some non-limiting examples, the element may comprise Mg, Zn, Cd, and/or Yb. In some non-limiting examples, the element may comprise Sn, Ni, Ti, Pd, Cr, Fe, and/or Co. In some non-limiting examples, the element may comprise Zr, Pt, V, Nb, Ir, and/or Os. In some non-limiting examples, the element may comprise Ta, Mo, and/or W. In some non-limiting examples, the element may comprise Mg, Ag, Al, Yb, and/or Li. In some non-limiting examples, the element may comprise Mg, Ag, and/or Yb. In some non-limiting examples, the element may comprise Mg, and/or Ag. In some non-limiting examples, the element may be Ag.

(225) In some non-limiting examples, the second electrode material may comprise a pure metal. In some non-limiting examples, the second electrode material is a pure metal. In some non-limiting examples, the second electrode material is pure Ag or substantially pure Ag. In some non-limiting examples, the second electrode material is pure Mg or substantially pure Mg. In some non-limiting examples, the second electrode material is pure Al or substantially pure Al.

(226) In some non-limiting examples, the second electrode material may comprise an alloy. In some non-limiting examples, the alloy may be an Ag-containing alloy, and/or an AgMg-containing alloy.

(227) In some non-limiting examples, the second electrode material may comprise other metals in place of, and/or in combination with, Ag. In some non-limiting examples, the second electrode material may comprise an alloy of Ag with at least one other metal. In some non-limiting examples, the second electrode material may comprise an alloy of Ag with Mg, and/or Yb. In some non-limiting examples, such alloy may be a binary alloy having a composition from about 5 vol. % Ag to about 95 vol. % Ag, with the remainder being the other metal. In some non-limiting examples, the second electrode material comprises Ag and Mg. In some non-limiting examples, the second electrode material comprises an Ag:Mg alloy having a composition from about 1:10 to about 10:1 by volume. In some non-limiting examples, the second electrode material comprises Ag and Yb. In some non-limiting examples, the second electrode material comprises a Yb:Ag alloy having a composition from about 1:20 to about 1-10:1 by volume. In some non-limiting examples, the second electrode material comprises Mg and Yb. In some non-limiting examples, the second electrode material comprises an Mg:Yb alloy. In some non-limiting examples, the second electrode material comprises Ag, Mg, and Yb. In some non-limiting examples, the second electrode material comprises an Ag:Mg:Yb alloy.

(228) In some non-limiting examples, the second electrode material may comprise oxygen (O). In some non-limiting examples, the second electrode material may comprise at least one metal and O. In some non-limiting examples, the second electrode material may comprise a metal oxide. In some non-limiting examples, the metal oxide comprises Zn, indium (I), tin (Sn), antimony (Sb), and/or gallium (Ga). In some non-limiting examples, the metal oxide may be a transparent conducting oxide (TCO). In some non-limiting examples, the TCO may comprise an indium oxide, tin oxide, antimony oxide, and/or gallium oxide. In some non-limiting examples, the TCO may comprise indium titanium oxide (ITO), ZnO, indium zinc oxide (IZO), and/or indium gallium zinc oxide (IGZO). In some non-limiting examples, the TCO may be electrically doped with other elements.

(229) In some non-limiting example, the second electrode **140** may be formed by metal and/or metal alloys.

(230) In some non-limiting examples, the second electrode **140** may comprise at least one metal or metal alloy and at least one metal oxide.

(231) In some non-limiting examples, the second electrode **140** may comprise a plurality of layers of the second electrode material. In some non-limiting examples, the second electrode material of a first one of the plurality of layers may be different from the second electrode material of a second one of the plurality of layers. In some non-limiting examples, the second electrode material of the first one of the plurality of layers may comprise a metal and the second electrode material of the second one of the plurality of layers may comprise a metal oxide.

(232) In some non-limiting examples, the second electrode material of at least one of the plurality of layers may comprise Yb. In some non-limiting examples, the second electrode material of one of the plurality of layers may comprise an Ag-containing alloy and/or an AgMg-containing alloy, and/or pure Ag, substantially pure Ag, pure Mg, and/or substantially pure Mg. In some non-limiting examples, the second electrode **140** is a bilayer Yb/AgMg coating.
(233) In some non-limiting examples, a first one of the plurality of layers that is proximate to the NIC **810** (top-most) may comprise an element selected from Ag, Au, Cu, Al, Sn, Ni, Ti, Pd, Cr, Fe, Co, Zr, Pt, V, Nb, Ir, Os, Ta, Mo, and/or W. In some non-limiting examples, the element may comprise Cu, Ag, and/or Au. In some non-limiting examples, the element may be Cu. In some non-limiting examples, the element may be Al. In some non-limiting examples, the element may comprise Sn, Ti, Pd, Cr, Fe, and/or Co. In some non-limiting examples, the element may comprise Ni, Zr, Pt, V, Nb, Ir, and/or Os. In some non-limiting examples, the element may comprise Ta, Mo, and/or W. In some non-limiting examples, the element may comprise Mg, Ag, and/or Al. In some non-limiting examples, the element may comprise Mg, and/or Ag. In some non-limiting examples, the element may be Ag.
(234) In some non-limiting examples, the second electrode **140** may comprise at least one additional element. In some non-limiting examples, such additional element may be a non-metallic element. In some non-limiting examples, the non-metallic material may be oxygen (O), sulfur (S), nitrogen (N), and/or carbon C. It will be appreciated by those having ordinary skill in the relevant art that, in some non-limiting examples, such additional element(s) may be incorporated into the second electrode **140** as a contaminant, due to the presence of such additional element(s) in the source material, equipment used for deposition, and/or the vacuum chamber environment. In some non-limiting examples, the concentration of such additional element(s) may be limited to be below a threshold concentration. In some non-limiting examples, such additional element(s) may form a compound together with other element(s) of the second electrode **140**. In some non-limiting examples, a concentration of the non-metallic element in the conductive coating material may be less than about 1%, about 0.1%, about 0.001%, about 0.0001%, about 0.00001%, about 0.000001% and/or about 0.0000001%. In some non-limiting examples, the conductive coating **830** has a composition in which a combined amount of 0 and C therein is less than about 10%, about 5%, about 1%, about 0.1%, about 0.001%, about 0.0001%, about 0.00001%, about 0.000001%, and/or about 0.0000001% In some non-limiting examples, the second electrode **140** may comprise a closed coating **4530**. In some non-limiting examples, the second electrode **140** may comprise a discontinuous coating **1050**.
(235) In some non-limiting examples, the second electrode **140** may be disposed in a pattern that may be defined by at least one region therein that is substantially devoid of a closed coating **4530** of the second electrode **140** on the first layer surface in the first portion **115**. In some non-limiting examples, the at least one region has disposed thereon, a metal patterning NIC **810**. In some non-limiting examples, the at least one region may separate the second electrode **140** into a plurality of discrete fragments thereof. In some non-limiting examples, at least two of such plurality of discrete fragments of the second electrode **140** may be electrically coupled. In some non-limiting examples, at least two of such plurality of discrete fragments of the second electrode **140** may be each electrically coupled to a common conductive layer or coating, including without limitation, the conductive coating **830**, to allow the flow of electric current between them. In some non-limiting examples, at least two of such plurality of discrete fragments of the second electrode **140** may be electrically insulated from one another.
(236) In some non-limiting examples, a thin conductive film comprising the second electrode **140** may be selectively applied, deposited and/or processed using a variety of techniques, including without limitation, evaporation (including without limitation, thermal evaporation and/or electron beam evaporation), photolithography, printing (including without limitation, ink jet and/or vapor jet printing, reel-to-reel printing and/or micro-contact transfer printing), PVD (including without

limitation, sputtering), CVD (including without limitation, PECVD and/or OVPD), laser annealing, LITI patterning, ALD, coating (including without limitation, spin coating, dip coating, line coating and/or spray coating), and/or combinations of any two or more thereof.
(237) For purposes of simplicity of description, in the present disclosure, a combination of a plurality of elements in a single layer is denoted by separating two such elements by a colon ":", while a plurality of (combination(s) of) elements comprising a plurality of layers in a multi-layer coating are denoted by separating two such layers by a slash "/". In some non-limiting examples, the layer after the slash may be deposited on the layer preceding the slash.
(238) In some non-limiting examples, for a Mg:Ag alloy, such alloy composition may range from about 1:10 to about 10:1 by volume.
(239) In some non-limiting examples, the deposition of the second electrode **140** may be performed using an open-mask and/or a mask-free deposition process.
(240) Driving Circuit
(241) In the present disclosure, the concept of a sub-pixel **2641**-**2643** (FIG. **26**) may be referenced herein, for simplicity of description only, as a sub-pixel **264***x*. Likewise, in the present disclosure, the concept of a pixel **340** (FIG. **3**) may be discussed in conjunction with the concept of at least one sub-pixel **264***x* thereof. For simplicity of description only, such composite concept is referenced herein as a "(sub-) pixel **340**/**264***x*" and such term is understood to suggest either or both of a pixel **340** and/or at least one sub-pixel **264***x* thereof, unless the context dictates otherwise.
(242) FIG. **3** is a circuit diagram for an example driving circuit such as may be provided by one or more of the TFT structures **200** shown in the backplane **20**. In the example shown, the circuit, shown generally at **300** is for an example driving circuit for an active-matrix OLED (AMOLED) device **100** (and/or a (sub-) pixel **340**/**264***x* thereof) for supplying current to the first electrode **120** and the second electrode **140**, and that controls emission of photons from the device **100** (and/or a (sub-) pixel **340**/**264***x*). The circuit **300** shown incorporates a plurality of p-type top-gate thin film TFT structures **200**, although the circuit **300** could equally incorporate one or more p-type bottom-gate TFT structures **200**, one or more n-type top-gate TFT structures **200**, one or more n-type bottom-gate TFT structures **200**, one or more other TFT structure(s) **200**, and/or any combination thereof, whether or not formed as one or a plurality of thin film layers. The circuit **300** comprises, in some non-limiting examples, a switching TFT **310**, a driving TFT **320** and a storage capacitor **330**.
(243) A (sub-) pixel **340**/**264***x* of the OLED display **100** is represented by a diode **340**. The source **311** of the switching TFT **310** is coupled to a data (or, in some non-limiting examples, a column selection) line **30**. The gate **312** of the switching TFT **310** is coupled to a gate (or, in some non-limiting examples, a row selection) line **31**. The drain **313** of the switching TFT **310** is coupled to the gate **322** of the driving TFT **320**.
(244) The source **321** of the driving TFT **320** is coupled to a positive (or negative) terminal of the power source **15**. The (positive) terminal of the power source **15** is represented by a power supply line (VDD) **32**.
(245) The drain **323** of the driving TFT **320** is coupled to the anode **341** (which may be, in some non-limiting examples, the first electrode **120**) of the diode **340** (representing a (sub-) pixel **340**/**264***x* of the OLED display **100**) so that the driving TFT **320** and the diode **340** (and/or a (sub-) pixel **340**/**264***x* of the OLED display **100**) are coupled in series between the power supply line (VDD) **32** and ground.
(246) The cathode **342** (which may be, in some non-limiting examples, the second electrode **140**) of the diode **340** (representing a (sub-) pixel **340**/**264***x* of the OLED display **100**) is represented as a resistor **350** in the circuit **300**.
(247) The storage capacitor **330** is coupled at its respective ends to the source **321** and gate **322** of the driving TFT **320**. The driving TFT **320** regulates a current passed through the diode **340** (representing a (sub-) pixel **340**/**264***x* of the OLED display **100**) in accordance with a voltage of a

charge stored in the storage capacitor **330**, such that the diode **340** outputs a desired luminance. The voltage of the storage capacitor **330** is set by the switching TFT **310**, coupling it to the data line **30**.
(248) In some non-limiting examples, a compensation circuit **370** is provided to compensate for any deviation in transistor properties from variances during the manufacturing process and/or degradation of the switching TFT **310** and/or driving TFT **320** over time.
(249) Semiconducting Layer
(250) In some non-limiting examples, the at least one semiconducting layer **130** may comprise a plurality of layers **131**, **133**, **135**, **137**, **139**, any of which may be disposed, in some non-limiting examples, in a thin film, in a stacked configuration, which may include, without limitation, any one or more of a hole injection layer (HIL) **131**, a hole transport layer (HTL) **133**, an emissive layer (EML) **135**, an electron transport layer (ETL) **137** and/or an electron injection layer (EIL) **139**. In the present disclosure, the term "semiconducting layer(s)" may be used interchangeably with "organic layer(s)" since the layers **131**, **133**, **135**, **137**, **139** in an OLED device **100** may in some non-limiting examples, may comprise organic semiconducting materials.
(251) In some non-limiting examples, the at least one semiconducting layer **130** may form a "tandem" structure comprising a plurality of EMLs **135**. In some non-limiting examples, such tandem structure may also comprise at least one charge generation layer (CGL).
(252) In some non-limiting examples, a thin film comprising a layer **131**, **133**, **135**, **137**, **139** in the stack making up the at least one semiconducting layer **130**, may be selectively applied, deposited and/or processed using a variety of techniques, including without limitation, evaporation (including without limitation, thermal evaporation and/or electron beam evaporation), photolithography, printing (including without limitation, ink jet and/or vapor jet printing, reel-to-reel printing and/or micro-contact transfer printing), PVD (including without limitation, sputtering), CVD (including without limitation, PECVD and/or OVPD), laser annealing, LITI patterning, ALD, coating (including without limitation, spin coating, dip coating, line coating and/or spray coating), and/or combinations of any two or more thereof.
(253) Those having ordinary skill in the relevant art will readily appreciate that the structure of the device **100** may be varied by omitting and/or combining one or more of the semiconductor layers **131**, **133**, **135**, **137**, **139**.
(254) Further, any of the layers **131**, **133**, **135**, **137**, **139** of the at least one semiconducting layer **130** may comprise any number of sub-layers. Still further, any of such layers **131**, **133**, **135**, **137**, **139** and/or sub-layer(s) thereof may comprise various mixture(s) and/or composition gradient(s). In addition, those having ordinary skill in the relevant art will appreciate that the device **100** may comprise one or more layers containing inorganic and/or organometallic materials and is not necessarily limited to devices composed solely of organic materials. By way of non-limiting example, the device **100** may comprise one or more quantum dots.
(255) In some non-limiting examples, the HIL **131** may be formed using a hole injection material, which may facilitate injection of holes by the anode **341**.
(256) In some non-limiting examples, the HTL **133** may be formed using a hole transport material, which may, in some non-limiting examples, exhibit high hole mobility.
(257) In some non-limiting examples, the ETL **137** may be formed using an electron transport material, which may, in some non-limiting examples, exhibit high electron mobility.
(258) In some non-limiting examples, the EIL **139** may be formed using an electron injection material, which may facilitate injection of electrons by the cathode **342**.
(259) In some non-limiting examples, the EML **135** may be formed, by way of non-limiting example, by doping a host material with at least one emitter material. In some non-limiting examples, the emitter material may be a fluorescent emitter, a phosphorescent emitter, a thermally activated delayed fluorescence (TADF) emitter and/or a plurality of any combination of these.
(260) In some non-limiting examples, the device **100** may be an OLED in which the at least one semiconducting layer **130** comprises at least an EML **135** interposed between conductive thin film

electrodes **120**, **140**, whereby, when a potential difference is applied across them, holes are injected into the at least one semiconducting layer **130** through the anode **341** and electrons are injected into the at least one semiconducting layer **130** through the cathode **342**.

(261) The injected holes and electrons tend to migrate through the various layers **131**, **133**, **135**, **137**, **139** until they reach and meet each other. When a hole and an electron are in close proximity, they tend to be attracted to one another due to a Coulomb force and in some examples, may combine to form a bound state electron-hole pair referred to as an exciton. Especially if the exciton is formed in the EML **135**, the exciton may decay through a radiative recombination process, in which a photon is emitted. The type of radiative recombination process may depend upon a spin state of an exciton. In some examples, the exciton may be characterized as having a singlet or a triplet spin state. In some non-limiting examples, radiative decay of a singlet exciton may result in fluorescence. In some non-limiting examples, radiative decay of a triplet exciton may result in phosphorescence.

(262) More recently, other photon emission mechanisms for OLEDs have been proposed and investigated, including without limitation, TADF. In some non-limiting examples, TADF emission occurs through a conversion of triplet excitons into single excitons via a reverse inter-system crossing process with the aid of thermal energy, followed by radiative decay of the singlet excitons.

(263) In some non-limiting examples, an exciton may decay through a non-radiative process, in which no photon is released, especially if the exciton is not formed in the EML **135**.

(264) In the present disclosure, the term "internal quantum efficiency" (IQE) of an OLED device **100** refers to a proportion of all electron-hole pairs generated in the device **100** that decay through a radiative recombination process and emit a photon.

(265) In the present disclosure, the term "external quantum efficiency" (EQE) of an OLED device **100** refers to a proportion of charge carriers delivered to the device **100** relative to a number of photons emitted by the device **100**. In some non-limiting examples, an EQE of 100% indicates that one photon is emitted for each electron that is injected into the device **100**.

(266) Those having ordinary skill in the relevant art will appreciate that the EQE of a device **100** may, in some non-limiting examples, be substantially lower than the IQE of the same device **100**. A difference between the EQE and the IQE of a given device **100** may in some non-limiting examples be attributable to a number of factors, including without limitation, adsorption and reflection of photons caused by various components of the device **100**.

(267) In some non-limiting examples, the device **100** may be an electro-luminescent quantum dot device in which the at least one semiconducting layer **130** comprises an active layer comprising at least one quantum dot. When current is provided by the power source **15** to the first electrode **120** and second electrode **140**, photons are emitted from the active layer comprising the at least one semiconducting layer **130** between them.

(268) Those having ordinary skill in the relevant art will readily appreciate that the structure of the device **100** may be varied by the introduction of one or more additional layers (not shown) at appropriate position(s) within the at least one semiconducting layer **130** stack, including without limitation, a hole blocking layer (not shown), an electron blocking layer (not shown), an additional charge transport layer (not shown) and/or an additional charge injection layer (not shown).

(269) Barrier Coating

(270) In some non-limiting examples, a barrier coating **1650** may be provided to surround and/or encapsulate the first electrode **120**, second electrode **140**, and the various layers of the at least one semiconducting layer **130** and/or the substrate **110** disposed thereon of the device **100**.

(271) In some non-limiting examples, the barrier coating **1650** may be provided to inhibit the various layers **120**, **130**, **140** of the device **100**, including the at least one semiconducting layer **130** and/or the cathode **342** from being exposed to moisture and/or ambient air, since these layers **120**, **130**, **140** may be prone to oxidation.

(272) In some non-limiting examples, application of the barrier coating **1650** to a highly non-

uniform surface may increase a likelihood of poor adhesion of the barrier coating **1650** to such surface.

(273) In some non-limiting examples, the absence of a barrier coating **1650** and/or a poorly-applied barrier coating **1650** may cause and/or contribute to defects in and/or partial and/or total failure of the device **100**. In some non-limiting examples, a poorly-applied barrier coating **1650** may reduce adhesion of the barrier coating **1650** to the device **100**. In some non-limiting examples, poor adhesion of the barrier coating **1650** may increase a likelihood of the barrier coating **1650** peeling off the device **100** in whole or in part, especially if the device **100** is bent and/or flexed. In some non-limiting examples, a poorly-applied barrier coating **1650** may allow air pockets to be trapped, during application of the barrier coating **1650**, between the barrier coating **1650** and an underlying surface of the device **100** to which the barrier coating **1650** was applied.

(274) In some non-limiting examples, the barrier coating **1650** may be a thin film encapsulation (TFE) layer **2050** (FIG. **20**B) and may be selectively applied, deposited and/or processed using a variety of techniques, including without limitation, evaporation (including without limitation, thermal evaporation and/or electron beam evaporation), photolithography, printing (including without limitation, ink jet and/or vapor jet printing, reel-to-reel printing and/or micro-contact transfer printing), PVD (including without limitation, sputtering), CVD (including without limitation, PECVD and/or OVPD), laser annealing, LITI patterning, ALD, coating (including without limitation, spin coating, dip coating, line coating and/or spray coating), and/or combinations of any two or more thereof.

(275) In some non-limiting examples, the barrier coating **1650** may be provided by laminating a pre-formed barrier film onto the device **100**. In some non-limiting examples, the barrier coating **1650** may comprise a multi-layer coating comprising at least one of an organic material, an inorganic material and/or any combination thereof. In some non-limiting examples, the barrier coating **1550** may further comprise a getter material and/or a desiccant.

(276) Lateral Aspect

(277) In some non-limiting examples, including where the OLED device **100** comprises a lighting panel, an entire lateral aspect of the device **100** may correspond to a single lighting element. As such, the substantially planar cross-sectional profile shown in FIG. **1** may extend substantially along the entire lateral aspect of the device **100**, such that photons are emitted from the device **100** substantially along the entirety of the lateral extent thereof. In some non-limiting examples, such single lighting element may be driven by a single driving circuit **300** of the device **100**.

(278) In some non-limiting examples, including where the OLED device **100** comprises a display module, the lateral aspect of the device **100** may be sub-divided into a plurality of emissive regions **1910** of the device **100**, in which the cross-sectional aspect of the device structure **100**, within each of the emissive region(s) **1910** shown, without limitation, in FIG. **1** causes photons to be emitted therefrom when energized.

(279) Emissive Regions

(280) In some non-limiting examples, individual emissive regions **1910** of the device **100** may be laid out in a lateral pattern. In some non-limiting examples, the pattern may extend along a first lateral direction. In some non-limiting examples, the pattern may also extend along a second lateral direction, which in some non-limiting examples, may be substantially normal to the first lateral direction. In some non-limiting examples, the pattern may have a number of elements in such pattern, each element being characterized by one or more features thereof, including without limitation, a wavelength of light emitted by the emissive region **1910** thereof, a shape of such emissive region **1910**, a dimension (along either or both of the first and/or second lateral direction(s)), an orientation (relative to either and/or both of the first and/or second lateral direction(s)) and/or a spacing (relative to either or both of the first and/or second lateral direction(s)) from a previous element in the pattern. In some non-limiting examples, the pattern may repeat in either or both of the first and/or second lateral direction(s).

(281) In some non-limiting examples, each individual emissive region **1910** of the device **100** is associated with, and driven by, a corresponding driving circuit **300** within the backplane **20** of the device **100**, in which the diode **340** corresponds to the OLED structure for the associated emissive region **1910**. In some non-limiting examples, including without limitation, where the emissive regions **1910** are laid out in a regular pattern extending in both the first (row) lateral direction and the second (column) lateral direction, there may be a signal line **30**, **31** in the backplane **20**, which may be the gate line (or row selection) line **31**, corresponding to each row of emissive regions **1910** extending in the first lateral direction and a signal line **30**, **31**, which may in some non-limiting examples be the data (or column selection) line **30**, corresponding to each column of emissive regions **1910** extending in the second lateral direction. In such a non-limiting configuration, a signal on the row selection line **31** may energize the respective gates **312** of the switching TFT(s) **310** electrically coupled thereto and a signal on the data line **30** may energize the respective sources of the switching TFT(s) **310** electrically coupled thereto, such that a signal on a row selection line **31**/data line **30** pair will electrically couple and energies, by the positive terminal (represented by the power supply line VDD **32**) of the power source **15**, the anode **341** of the OLED structure of the emissive region **1910** associated with such pair, causing the emission of a photon therefrom, the cathode **342** thereof being electrically coupled to the negative terminal of the power source **15**.
(282) In some non-limiting examples, each emissive region **1910** of the device **100** corresponds to a single display pixel **340**. In some non-limiting examples, each pixel **340** emits light at a given wavelength spectrum. In some non-limiting examples, the wavelength spectrum corresponds to a colour in, without limitation, the visible light spectrum.
(283) In some non-limiting examples, each emissive region **1910** of the device **100** corresponds to a sub-pixel **264***x* of a display pixel **340**. In some non-limiting examples, a plurality of sub-pixels **264***x* may combine to form, or to represent, a single display pixel **340**.
(284) In some non-limiting examples, a single display pixel **340** may be represented by three sub-pixels **2641-2643**. In some non-limiting examples, the three sub-pixels **2641-2643** may be denoted as, respectively, R(ed) sub-pixels **2641**, G(reen) sub-pixels **2642** and/or B(lue) sub-pixels **2643**. In some non-limiting examples, a single display pixel **340** may be represented by four sub-pixels **264***x*, in which three of such sub-pixels **264***x* may be denoted as R, G and B sub-pixels **2641-2643** and the fourth sub-pixel **264***x* may be denoted as a W(hite) sub-pixel **264***x*. In some non-limiting examples, the emission spectrum of the light emitted by a given sub-pixel **264***x* corresponds to the colour by which the sub-pixel **264***x* is denoted. In some non-limiting examples, the wavelength of the light does not correspond to such colour but further processing is performed, in a manner apparent to those having ordinary skill in the relevant art, to transform the wavelength to one that does so correspond.
(285) Since the wavelength of sub-pixels **264***x* of different colours may be different, the optical characteristics of such sub-pixels **264***x* may differ, especially if a common electrode **120**, **140** having a substantially uniform thickness profile is employed for sub-pixels **264***x* of different colours.
(286) When a common electrode **120**, **140** having a substantially uniform thickness is provided as the second electrode **140** in a device **100**, the optical performance of the device **100** may not be readily be fine-tuned according to an emission spectrum associated with each (sub-)pixel **340**/**264***x*. The second electrode **140** used in such OLED devices **100** may in some non-limiting examples, be a common electrode **120**, **140** coating a plurality of (sub-)pixels **340**/**264***x*. By way of non-limiting example, such common electrode **120**, **140** may be a relatively thin conductive film having a substantially uniform thickness across the device **100**. While efforts have been made in some non-limiting examples, to tune the optical microcavity effects associated with each (sub-)pixel **340**/**264***x* color by varying a thickness of organic layers disposed within different (sub-)pixel(s) **340**/**264***x*, such approach may, in some non-limiting examples, provide a significant degree of tuning of the optical microcavity effects in at least some cases. In addition, in some non-limiting examples, such

approach may be difficult to implement in an OLED display production environment.
(287) As a result, the presence of optical interfaces created by numerous thin-film layers and coatings with different refractive indices, such as may in some non-limiting examples be used to construct opto-electronic devices including without limitation OLED devices **100**, may create different optical microcavity effects for sub-pixels **264***x* of different colours.
(288) Some factors that may impact an observed microcavity effect in a device **100** includes, without limitation, the total path length (which in some non-limiting examples may correspond to the total thickness of the device **100** through which photons emitted therefrom will travel before being out-coupled) and the refractive indices of various layers and coatings.
(289) In some non-limiting examples, modulating the thickness of an electrode **120**, **140** in and across a lateral aspect **410** of emissive region(s) **1910** of a (sub-) pixel **340**/**264***x* may impact the microcavity effect observable. In some non-limiting examples, such impact may be attributable to a change in the total optical path length.
(290) In some non-limiting examples, this may be particularly the case where the electrode **120**, **140** is formed of at least one conductive coating **830**. In some non-limiting examples, the total optical path length, and concomitantly, the optical microcavity effect observable, may also be modulated by a change in a thickness of any layer, including without limitation, the NIC **810**, NPC **1120**, and/or a capping layer (CPL) **3610** (FIG. **36**A), disposed in a given emissive region **1910**.
(291) In some non-limiting examples, the optical properties of the device **100**, and/or in some non-limiting examples, across the lateral aspect **410** of emissive region(s) **1910** of a (sub-) pixel **340**/**264***x* that may be varied by modulating at least one optical microcavity effect, include, without limitation, the emission spectrum, the intensity (including without limitation, luminous intensity) and/or angular distribution of emitted light, including without limitation, an angular dependence of a brightness and/or color shift of the emitted light.
(292) In some non-limiting examples, a sub-pixel **264***x* is associated with a first set of other sub-pixels **264***x* to represent a first display pixel **340** and also with a second set of other sub-pixels **264***x* to represent a second display pixel **340**, so that the first and second display pixels **340** may have associated therewith, the same sub-pixel(s) **264***x*.
(293) The pattern and/or organization of sub-pixels **264***x* into display pixels **340** continues to develop. All present and future patterns and/or organizations are considered to fall within the scope of the present disclosure.
(294) Non-Emissive Regions
(295) In some non-limiting examples, the various emissive regions **1910** of the device **100** are substantially surrounded and separated by, in at least one lateral direction, one or more non-emissive regions **1920**, in which the structure and/or configuration along the cross-sectional aspect, of the device structure **100** shown, without limitation, in FIG. **1**, is varied, so as to substantially inhibit photons to be emitted therefrom. In some non-limiting examples, the non-emissive regions **1920** comprise those regions in the lateral aspect, that are substantially devoid of an emissive region **1910**.
(296) Thus, as shown in the cross-sectional view of FIG. **4**, the lateral topology of the various layers of the at least one semiconducting layer **130** may be varied to define at least one emissive region **1910**, surrounded (at least in one lateral direction) by at least one non-emissive region **1920**.
(297) In some non-limiting examples, the emissive region **1910** corresponding to a single display (sub-) pixel **340**/**264***x* may be understood to have a lateral aspect **410**, surrounded in at least one lateral direction by at least one non-emissive region **1920** having a lateral aspect **420**.
(298) A non-limiting example of an implementation of the cross-sectional aspect of the device **100** as applied to an emissive region **1910** corresponding to a single display (sub-) pixel **340**/**264***x* of an OLED display **100** will now be described. While features of such implementation are shown to be specific to the emissive region **1910**, those having ordinary skill in the relevant art will appreciate that in some non-limiting examples, more than one emissive region **1910** may encompass common

features.

(299) In some non-limiting examples, the first electrode **120** may be disposed over an exposed layer surface **111** of the device **100**, in some non-limiting examples, within at least a part of the lateral aspect **410** of the emissive region **1910**. In some non-limiting examples, at least within the lateral aspect **410** of the emissive region **1910** of the (sub-) pixel(s) **340**/**264***x*, the exposed layer surface **111**, may, at the time of deposition of the first electrode **120**, comprise the TFT insulating layer **280** of the various TFT structures **200** that make up the driving circuit **300** for the emissive region **1910** corresponding to a single display (sub-) pixel **340**/**264***x*.

(300) In some non-limiting examples, the TFT insulating layer **280** may be formed with an opening **430** extending therethrough to permit the first electrode **120** to be electrically coupled to one of the TFT electrodes **240**, **260**, **270**, including, without limitation, as shown in FIG. **4**, the TFT drain electrode **270**.

(301) Those having ordinary skill in the relevant art will appreciate that the driving circuit **300** comprises a plurality of TFT structures **200**, including without limitation, the switching TFT **310**, the driving TFT **320** and/or the storage capacitor **330**. In FIG. **4**, for purposes of simplicity of illustration, only one TFT structure **200** is shown, but it will be appreciated by those having ordinary skill in the relevant art, that such TFT structure **200** is representative of such plurality thereof that comprise the driving circuit **300**.

(302) In a cross-sectional aspect, the configuration of each emissive region **1910** may, in some non-limiting examples, be defined by the introduction of at least one pixel definition layer (PDL) **440** substantially throughout the lateral aspects **420** of the surrounding non-emissive region(s) **1920**. In some non-limiting examples, the PDLs **440** may comprise an insulating organic and/or inorganic material.

(303) In some non-limiting examples, the PDLs **440** are deposited substantially over the TFT insulating layer **280**, although, as shown, in some non-limiting examples, the PDLs **440** may also extend over at least a part of the deposited first electrode **120** and/or its outer edges.

(304) In some non-limiting examples, as shown in FIG. **4**, the cross-sectional thickness and/or profile of the PDLs **440** may impart a substantially valley-shaped configuration to the emissive region **1910** of each (sub-) pixel **340**/**264***x* by a region of increased thickness along a boundary of the lateral aspect **420** of the surrounding non-emissive region **1920** with the lateral aspect **410** of the surrounded emissive region **1910**, corresponding to a (sub-) pixel **340**/**264***x*.

(305) In some non-limiting examples, the profile of the PDLs **440** may have a reduced thickness beyond such valley-shaped configuration, including without limitation, away from the boundary between the lateral aspect **420** of the surrounding non-emissive region **1920** and the lateral aspect **410** of the surrounded emissive region **1910**, in some non-limiting examples, substantially well within the lateral aspect **420** of such non-emissive region **1920**.

(306) While the PDL(s) **440** have been generally illustrated as having a linearly-sloped surface to form a valley-shaped configuration that define the emissive region(s) **1910** surrounded thereby, those having ordinary skill in the relevant art will appreciate that in some non-limiting examples, at least one of the shape, aspect ratio, thickness, width and/or configuration of such PDL(s) **440** may be varied. By way of non-limiting example, a PDL **440** may be formed with a steeper or more gradually-sloped part. In some non-limiting examples, such PDL(s) **440** may be configured to extend substantially normally away from a surface on which it is deposited, that covers one or more edges of the first electrode **120**. In some non-limiting examples, such PDL(s) **440** may be configured to have deposited thereon at least one semiconducting layer **130** by a solution-processing technology, including without limitation, by printing, including without limitation, ink-jet printing.

(307) In some non-limiting examples, the at least one semiconducting layer **130** may be deposited over the exposed layer surface **111** of the device **100**, including at least a part of the lateral aspect **410** of such emissive region **1910** of the (sub-) pixel(s) **340**/**264***x*. In some non-limiting examples,

at least within the lateral aspect **410** of the emissive region **1910** of the (sub-) pixel(s) **340**/**264***x*, such exposed layer surface **111**, may, at the time of deposition of the at least one semiconducting layer **130** (and/or layers **131**, **133**, **135**, **137**, **139** thereof), comprise the first electrode **120**.
(308) In some non-limiting examples, the at least one semiconducting layer **130** may also extend beyond the lateral aspect **410** of the emissive region **1910** of the (sub-) pixel(s) **340**/**264***x* and at least partially within the lateral aspects **420** of the surrounding non-emissive region(s) **1920**. In some non-limiting examples, such exposed layer surface **111** of such surrounding non-emissive region(s) **1920** may, at the time of deposition of the at least one semiconducting layer **130**, comprise the PDL(s) **440**.
(309) In some non-limiting examples, the second electrode **140** may be disposed over an exposed layer surface **111** of the device **100**, including at least a part of the lateral aspect **410** of the emissive region **1910** of the (sub-) pixel(s) **340**/**264***x*. In some non-limiting examples, at least within the lateral aspect **410** of the emissive region **1910** of the (sub-) pixel(s) **340**/**264***x*, such exposed layer surface **111**, may, at the time of deposition of the second electrode **130**, comprise the at least one semiconducting layer **130**.
(310) In some non-limiting examples, the second electrode **140** may also extend beyond the lateral aspect **410** of the emissive region **1910** of the (sub-) pixel(s) **340**/**264***x* and at least partially within the lateral aspects **420** of the surrounding non-emissive region(s) **1920**. In some non-limiting examples, such exposed layer surface **111** of such surrounding non-emissive region(s) **1920** may, at the time of deposition of the second electrode **140**, comprise the PDL(s) **440**.
(311) In some non-limiting examples, the second electrode **140** may extend throughout substantially all or a substantial part of the lateral aspects **420** of the surrounding non-emissive region(s) **1920**.
(312) Transmissivity
(313) Because the OLED device **100** emits photons through either or both of the first electrode **120** (in the case of a bottom-emission and/or a double-sided emission device), as well as the substrate **110** and/or the second electrode **140** (in the case of a top-emission and/or double-sided emission device), it may be desirable to make either or both of the first electrode **120** and/or the second electrode **140** substantially photon- (or light)-transmissive (“transmissive”), in some non-limiting examples, at least across a substantial part of the lateral aspect **410** of the emissive region(s) **1910** of the device **100**. In the present disclosure, such a transmissive element, including without limitation, an electrode **120**, **140**, a material from which such element is formed, and/or property thereof, may comprise an element, material and/or property thereof that is substantially transmissive (“transparent”), and/or, in some non-limiting examples, partially transmissive (“semi-transparent”), in some non-limiting examples, in at least one wavelength range.
(314) A variety of mechanisms have been adopted to impart transmissive properties to the device **100**, at least across a substantial part of the lateral aspect **410** of the emissive region(s) **1910** thereof.
(315) In some non-limiting examples, including without limitation, where the device **100** is a bottom-emission device and/or a double-sided emission device, the TFT structure(s) **200** of the driving circuit **300** associated with an emissive region **1910** of a (sub-) pixel **340**/**264***x*, which may at least partially reduce the transmissivity of the surrounding substrate **110**, may be located within the lateral aspect **420** of the surrounding non-emissive region(s) **1920** to avoid impacting the transmissive properties of the substrate **110** within the lateral aspect **410** of the emissive region **1910**.
(316) In some non-limiting examples, where the device **100** is a double-sided emission device, in respect of the lateral aspect **410** of an emissive region **1910** of a (sub-) pixel **340**/**264***x*, a first one of the electrode **120**, **140** may be made substantially transmissive, including without limitation, by at least one of the mechanisms disclosed herein, in respect of the lateral aspect **410** of neighbouring and/or adjacent (sub-) pixel(s) **340**/**264***x*, a second one of the electrodes **120**, **140** may be made

substantially transmissive, including without limitation, by at least one of the mechanisms disclosed herein. Thus, the lateral aspect **410** of a first emissive region **1910** of a (sub-) pixel **340**/**264***x* may be made substantially top-emitting while the lateral aspect **410** of a second emissive region **1910** of a neighbouring (sub-) pixel **340**/**264***x* may be made substantially bottom-emitting, such that a subset of the (sub-) pixel(s) **340**/**264***x* are substantially top-emitting and a subset of the (sub-) pixel(s) **340**/**264***x* are substantially bottom-emitting, in an alternating (sub-) pixel **340**/**264***x* sequence, while only a single electrode **120**, **140** of each (sub-) pixel **340**/**264***x* is made substantially transmissive.

(317) In some non-limiting examples, a mechanism to make an electrode **120**, **140**, in the case of a bottom-emission device and/or a double-sided emission device, the first electrode **120**, and/or in the case of a top-emission device and/or a double-sided emission device, the second electrode **140**, transmissive is to form such electrode **120**, **140** of a transmissive thin film.

(318) In some non-limiting examples, a sheet resistance R**2** of the conductive coating **830** may generally correspond to a sheet resistance of the conductive coating **380** measured in isolation from other components, layers, and/or parts of the device **100**. In some non-limiting examples, the conductive coating **830** may be formed as a thin film. Accordingly, in some non-limiting examples, the sheet resistance R**3** for the conductive coating **830** may be determined and/or calculated based on the composition, thickness, and/or morphology of such thin film. In some non-limiting examples, the sheet resistance R**3** may be less than about 10 Ω/sqr, be less than about 5 Ω/sqr, be less than about 1 Ω/sqr, be less than about 0.5 Ω/sqr, 0.2 Ω/sqr, and/or be less than about 0.1 Ω/sqr.

(319) In some non-limiting examples, the conductive coating **830** may comprise a conductive coating material **831**.

(320) In some non-limiting examples, the conductive coating material **831** may comprise a metal having a bond dissociation energy of the conductive coating material **831** of less than 300 kJ/mol, less than 200 kJ/mol, less than 165 kJ/mol, less than 150 kJ/mol, less than 100 kJ/mol, less than 50 kJ/mol, and/or less than 20 kJ/mol.

(321) In some non-limiting examples, the conductive coating material **831** may comprise an element selected from K, Na, Li, Ba, Cs, Yb, Ag, Au, Cu, Al, Mg, Zn, Cd, Sn, and/or yttrium (Y). In some non-limiting examples, the element may comprise K, Na, Li, Ba, Cs, Tb, Ag, Au, Cu, Al, and/or Mg. In some non-limiting examples, the element may comprise Cu, Ag, and/or Au. In some non-limiting examples, the element may be Cu. In some non-limiting examples, the element may be Al. In some non-limiting examples, the element may comprise Mg, Zn, Cd, and/or Yb. In some non-limiting examples, the element may comprise Mg, Ag, Al, Yb, and/or Li. In some non-limiting examples, the element may comprise Mg, Ag, and/or Yb. In some non-limiting examples, the element may comprise Mg, and/or Ag. In some non-limiting examples, the element may be Ag.

(322) In some non-limiting examples, the conductive coating material **831** may comprise a pure metal. In some non-limiting examples, the conductive coating **830** is a pure metal. In some non-limiting examples, the conductive coating **830** is pure Ag or substantially pure Ag. In some non-limiting examples, the substantially pure Ag may have a purity of at least about 95%, at least about 99%, at least about 99.9%, at least about 99.99%, at least about 99.999%, and/or at least about 99.9995%. In some non-limiting examples, the conductive coating **830** is pure Mg or substantially pure Mg. In some non-limiting examples, the substantially pure Mg may have a purity of at least about 95%, at least about 99%, at least about 99.9%, at least about 99.99%, at least about 99.999%, and/or at least about 99.9995%.

(323) In some non-limiting examples, the conductive coating **830** may comprise an alloy. In some non-limiting examples, the alloy may be an Ag-containing alloy, an Mg-containing alloy, and/or an AgMg-containing alloy. In some non-limiting examples, the AgMg-containing alloy may have an alloy composition that may range from 1:10 (Ag:Mg) to about 10:1 by volume.

(324) In some non-limiting examples, the conductive coating material **831** may comprise other metals in place of, and/or in combination with, Ag. In some non-limiting examples, the conductive

coating material **831** may comprise an alloy of Ag with at least one other metal. In some non-limiting examples, the conductive coating material **831** may comprise an alloy of Ag with Mg, and/or Yb. In some non-limiting examples, such alloy may be a binary alloy having a composition from about 5 vol. % Ag to about 95 vol. % Ag, with the remainder being the other metal. In some non-limiting examples, the conductive coating material **831** comprises Ag and Mg. In some non-limiting examples, the conductive coating material **831** comprises an Ag:Mg alloy having a composition from about 1:10 to about 10:1 by volume. In some non-limiting examples, the conductive coating material **831** comprises Ag and Yb. In some non-limiting examples, the conductive coating material **831** comprises a Yb:Ag alloy having a composition from about 1:20 to about 1-10:1 by volume. In some non-limiting examples, the conductive coating material **831** comprises Mg and Yb. In some non-limiting examples, the conductive coating material **831** comprises an Mg:Yb alloy. In some non-limiting examples, the conductive coating material **831** comprises Ag, Mg, and Yb. In some non-limiting examples, the conductive coating material **831** comprises an Ag:Mg:Yb alloy.
(325) In some non-limiting examples, the conductive coating **830** may comprise at least one additional element. In some non-limiting examples, such additional element may be a non-metallic element. In some non-limiting examples, the non-metallic material may be oxygen (O), sulfur (S), nitrogen (N), and/or carbon (C). It will be appreciated by those having ordinary skill in the relevant art that, in some non-limiting examples, such additional element(s) may be incorporated into the conductive coating **830** as a contaminant, due to the presence of such additional element(s) in the source material, equipment used for deposition, and/or the vacuum chamber environment. In some non-limiting examples, the concentration of such additional element(s) may be limited to be below a threshold concentration. In some non-limiting examples, such additional element(s) may form a compound together with other element(s) of the conductive coating **830**. In some non-limiting examples, a concentration of the non-metallic element in the conductive coating material **831** may be less than about 1%, about 0.1%, about 0.001%, about 0.0001%, about 0.00001%, about 0.000001% and/or about 0.0000001%. In some non-limiting examples, the conductive coating **830** has a composition in which a combined amount of 0 and C therein is less than about 10%, about 5%, about 1%, about 0.1%, about 0.001%, about 0.0001%, about 0.00001%, about 0.000001%, and/or about 0.0000001%
(326) It has now been, somewhat surprisingly, found that reducing a concentration of certain non-metallic element in the conductive coating **830** may facilitate selected deposition of the conductive coating **830**. Without wishing to be bound by any particular theory, it may be postulated that certain non-metallic elements, such as, by way of non-limiting examples, O and/or C, when present in the vapour flux of the conductive coating **830** and/or in the deposition chamber and/or environment, may be deposited onto the surface of the NIC **810** to act as nucleation sites for the metallic element(s) of the conductive coating **830**. It may be postulated that reducing a concentration of such non-metallic elements that could act as nucleation sites may facilitate reducing an amount of conductive coating material **831** deposited on the exposed layer surface **111** of the NIC **810**.
(327) In some non-limiting examples, the conductive coating **830** and the metallic coating **138** may comprise a common metal. In some non-limiting examples, the conductive coating material **831** and the metallic coating material have the same composition.
(328) In some non-limiting examples, the conductive coating **830** may comprise a plurality of layers of the conductive coating material **831**. In some non-limiting examples, the conductive coating material **831** of a first one of the plurality of layers may be different from the conductive coating material **831** of a second one of the plurality of layers. In some non-limiting examples, the conductive coating **830** may comprise a multilayer coating. In some non-limiting examples, such multilayer coating may comprise Yb/Ag, Yb/Mg, Yb/Mg:Ag, Yb/Yb:Ag, Yb/Ag/Mg, and/or Yb/Mg/Ag.
(329) In some non-limiting examples, especially in the case of such thin conductive films, a

relatively thin layer thickness may be up to substantially a few tens of nm so as to contribute to enhanced transmissive qualities but also favorable optical properties (including without limitation, reduced microcavity effects) for use in an OLED device **100**.
(330) In some non-limiting examples, such thin conductive films may comprise an intermediate stage thin film.
(331) In some non-limiting examples, a reduction in the thickness of an electrode **120**, **140** to promote transmissive qualities may be accompanied by an increase in the sheet resistance of the electrode **120**, **140**.
(332) In some non-limiting examples, a device **100** having at least one electrode **120**, **140** with a high sheet resistance creates a large current-resistance (IR) drop when coupled to the power source **15**, in operation. In some non-limiting examples, such an IR drop may be compensated for, to some extent, by increasing a level (VDD) of the power source **15**. However, in some non-limiting examples, increasing the level of the power source **15** to compensate for the IR drop due to high sheet resistance, for at least one (sub-) pixel **340**/**264***x* may call for increasing the level of a voltage to be supplied to other components to maintain effective operation of the device **100**.
(333) In some non-limiting examples, to reduce power supply demands for a device **100** without significantly impacting an ability to make an electrode **120**, **140** substantially transmissive (by employing at least one thin film layer of any combination of TCOs, thin metal films and/or thin metallic alloy films), an auxiliary electrode **1750** and/or busbar structure **4150** may be formed on the device **100** to allow current to be carried more effectively to various emissive region(s) of the device **100**, while at the same time, reducing the sheet resistance and its associated IR drop of the transmissive electrode **120**, **140**.
(334) In some non-limiting examples, a sheet resistance specification, for a common electrode **120**, **140** of an AMOLED display device **100**, may vary according to a number of parameters, including without limitation, a (panel) size of the device **100** and/or a tolerance for voltage variation across the device **100**. In some non-limiting examples, the sheet resistance specification may increase (that is, a lower sheet resistance is specified) as the panel size increases. In some non-limiting examples, the sheet resistance specification may increase as the tolerance for voltage variation decreases.
(335) In some non-limiting examples, a sheet resistance specification may be used to derive an example thickness of an auxiliary electrode **1750** and/or a busbar **4150** to comply with such specification for various panel sizes. In one non-limiting example, an aperture ratio of 0.64 was assumed for all display panel sizes and a thickness of the auxiliary electrode **1750** for various example panel sizes were calculated for example voltage tolerances of 0.1 V and 0.2 V in Table 1 below.
(336) TABLE-US-00001 TABLE 1 Example Auxiliary Electrode Thickness for Various Panel Size and Voltage Tolerances Panel Size (in.) 9.7 12.9 15.4 27 65 Specified Thickness (nm) @0.1 V 132 239 335 1200 6500 @0.2 V 67 117 174 516 2800
(337) By way of non-limiting example, for a top-emission device, the second electrode **140** may be made transmissive. On the other hand, in some non-limiting examples, such auxiliary electrode **1750** and/or busbar **4150** may not be substantially transmissive but may be electrically coupled to the second electrode **140**, including without limitation, by deposition of a conductive coating **830** therebetween, to reduce an effective sheet resistance of the second electrode **140**.
(338) In some non-limiting examples, such auxiliary electrode **1750** may be positioned and/or shaped in either or both of a lateral aspect and/or cross-sectional aspect so as not to interfere with the emission of photons from the lateral aspect **410** of the emissive region **1910** of a (sub-) pixel **340**/**264***x*.
(339) In some non-limiting examples, a mechanism to make the first electrode **120**, and/or the second electrode **140**, is to form such electrode **120**, **140** in a pattern across at least a part of the lateral aspect **410** of the emissive region(s) **1910** thereof and/or in some non-limiting examples,

across at least a part of the lateral aspect **420** of the non-emissive region(s) **1920** surrounding them. In some non-limiting examples, such mechanism may be employed to form the auxiliary electrode **1750** and/or busbar **4150** in a position and/or shape in either or both of a lateral aspect and/or cross-sectional aspect so as not to interfere with the emission of photons from the lateral aspect **410** of the emissive region **1910** of a (sub-) pixel **340**/**264***x*, as discussed above.

(340) In some non-limiting examples, the device **100** may be configured such that it is substantially devoid of a conductive oxide material in an optical path of photons emitted by the device **100**. By way of non-limiting example, in the lateral aspect **410** of at least one emissive region **1910** corresponding to a (sub-) pixel **340**/**264***x*, at least one of the layers and/or coatings deposited after the at least one semiconducting layer **130**, including without limitation, the second electrode **140**, the NIC **810** and/or any other layers and/or coatings deposited thereon, may be substantially devoid of any conductive oxide material. In some non-limiting examples, being substantially devoid of any conductive oxide material may reduce absorption and/or reflection of light emitted by the device **100**. By way of non-limiting example, conductive oxide materials, including without limitation, ITO and/or IZO, may absorb light in at least the B(lue) region of the visible spectrum, which may, in generally, reduce efficiency and/or performance of the device **100**.

(341) In some non-limiting examples, a combination of these and/or other mechanisms may be employed.

(342) Additionally, in some non-limiting examples, in addition to rendering one or more of the first electrode **120**, the second electrode **140**, the auxiliary electrode **1750** and/or the busbar **4150**, substantially transmissive across at least across a substantial part of the lateral aspect **410** of the emissive region **1910** corresponding to the (sub-) pixel(s) **340**/**264***x* of the device **100**, in order to allow photons to be emitted substantially across the lateral aspect **410** thereof, it may be desired to make at least one of the lateral aspect(s) **420** of the surrounding non-emissive region(s) **1920** of the device **100** substantially transmissive in both the bottom and top directions, so as to render the device **100** substantially transmissive relative to light incident on an external surface thereof, such that a substantial part such externally-incident light may be transmitted through the device **100**, in addition to the emission (in a top-emission, bottom-emission and/or double-sided emission) of photons generated internally within the device **100** as disclosed herein.

(343) Conductive Coating

(344) In the present disclosure, the terms “conductive coating” and “electrode coating” may be used interchangeably to refer to similar concepts and references to a conductive coating **830** herein, in the context of being patterned by selective deposition of an NIC **810** and/or an NPC **1120** may, in some non-limiting examples, be applicable to an electrode coating **830** in the context of being patterned by selective deposition of a patterning coating **810**, **1120**. In some non-limiting examples, reference to an electrode coating **830** may signify a coating having a specific composition as described herein. Similarly, in the present disclosure, the terms “conductive coating material” and “electrode coating material” may be used interchangeably to refer to similar concepts and references to a conductive coating material **831** herein.

(345) In some non-limiting examples, the conductive coating material **831** (FIG. **9**) used to deposit a conductive coating **830** onto an exposed layer surface **111** of underlying material may be a substantially pure element. In some further non-limiting examples, the conductive coating **830** includes a substantially pure element. In some other non-limiting examples, the conductive coating **830** includes two or more elements, which may for example be provided as an alloy or a mixture.

(346) In some non-limiting examples, at least one component of such mixture is not deposited on such surface, may not be deposited on such exposed layer surface **111** during deposition and/or may be deposited in a small amount relative to an amount of remaining component(s) of such mixture that are deposited on such exposed layer surface **111**.

(347) In some non-limiting examples, such at least one component of such mixture may have a property relative to the remaining component(s) to selectively deposit substantially only the

remaining component(s). In some non-limiting examples, the property may be a vapor pressure.
(348) In some non-limiting examples, such at least one component of such mixture may have a lower vapor pressure relative to the remaining components.
(349) In some non-limiting examples, the conductive coating material **831** may be a copper (Cu)-magnesium (Cu—Mg) mixture, in which Cu has a lower vapor pressure than Mg.
(350) In some non-limiting examples, the conductive coating material **831** used to deposit a conductive coating **830** onto an exposed layer surface **111** may be substantially pure.
(351) In some non-limiting examples, the conductive coating material **831** used to deposit Mg is and in some non-limiting examples, comprises substantially pure Mg. In some non-limiting examples, substantially pure Mg may exhibit substantially similar properties relative to pure Mg. In some non-limiting examples, purity of Mg may be about 95% or higher, about 98% or higher, about 99% or higher, about 99.9% or higher and/or about 99.99% and higher.
(352) In some non-limiting examples, a conductive coating **830** in an opto-electronic device according to various example includes Mg. In some non-limiting examples, the conductive coating **830** comprises substantially pure Mg. In some non-limiting examples, the conductive coating **830** includes other metals in place of and/or in combination with Mg. In some non-limiting examples, the conductive coating **830** includes an alloy of Mg with one or more other metals. In some non-limiting examples, the conductive coating **830** includes an alloy of Mg with Yb, Cd, Zn, and/or Ag. In some non-limiting examples, such alloy may be a binary alloy having a composition ranging from between about 5 vol. % Mg and about 95 vol. % Mg, with the remainder being the other metal. In some non-limiting examples, the conductive coating **830** includes a Mg:Ag alloy having a composition ranging from between about 1:10 to about 10:1 by volume.
(353) In some non-limiting examples, the conductive coating **830** and/or the conductive coating material **831** in an opto-electronic device according to various examples includes Ag. In some non-limiting examples, the conductive coating **830** and/or the conductive coating material **831** comprises substantially pure Ag. In some non-limiting examples, the conductive coating **830** and/or the conductive coating material **831** includes other metals in place of and/or in combination with Ag. In some non-limiting examples, the conductive coating **830** and/or the conductive coating material **831** includes an alloy of Ag with one or more other metals. In some non-limiting examples, the conductive coating **830** and/or the conductive coating material **831** includes an alloy of Ag with Mg, Yb, and/or Zn. In some non-limiting examples, such alloy may be a binary alloy having a composition from about 5 vol. % Ag to about 95 vol. % Ag, with the remainder being the other metal. In some non-limiting examples, the conductive coating **830** and/or the conductive coating material **831** includes Ag and Mg. Non-limiting examples of such conductive coating **830** and/or the conductive coating material **831** includes an Mg:Ag alloy having a composition from about 1:10 to about 10:1 by volume. In some non-limiting examples, the conductive coating **830** and/or the conductive coating material **831** includes Ag and Yb. Non-limiting examples of such conductive coating **830** includes a Yb:Ag alloy having a composition from about 1:20 to about 10:1 by volume. In some non-limiting examples, the conductive coating **830** includes Mg and Yb, for example as an Mg:Yb alloy. In some non-limiting examples, the conductive coating **830** and/or the conductive coating material **831** includes Ag, Mg, and Yb, for example as an Ag:Mg:Yb alloy.
(354) In some non-limiting examples, the conductive coating **830** includes two or more layers having different compositions from one another. In some non-limiting examples, two or more layers of the conductive coating **830** include a different element from one another. Non-limiting examples of such conductive coating **830** include multilayer coatings formed by: Yb/Ag, Yb/Mg, Yb/Mg:Ag, Mg/Ag, Yb/Yb:Ag, Yb/Ag/Mg, and/or Yb/Mg/Ag.
(355) Patterning
(356) As a result of the foregoing, it may be desirable to selectively deposit, across the lateral aspect **410** of the emissive region **1910** of a (sub-) pixel **340**/**264***x* and/or the lateral aspect **420** of the non-emissive region(s) **1920** surrounding the emissive region **1910**, a device feature, including

without limitation, at least one of the first electrode **120**, the second electrode **140**, the auxiliary electrode **1750** and/or busbar **4150** and/or a conductive element electrically coupled thereto, in a pattern, on an exposed layer surface **111** of a frontplane **10** layer of the device **100**. In some non-limiting examples, the first electrode **120**, the second electrode **140**, the auxiliary electrode **1750** and/or the busbar **4150** may be deposited in at least one of a plurality of conductive coatings **830**.
(357) However, it may not be feasible to employ a shadow mask such as an FMM that may, in some non-limiting examples, be used to form relatively small features, with a feature size on the order of tens of microns or smaller to achieve such patterning of a conductive coating **830**, since, in some non-limiting examples: an FMM may be deformed during a deposition process, especially at high temperatures, such as may be employed for deposition of a thin conductive film; limitations on the mechanical (including, without limitation, tensile) strength of the FMM and/or shadowing effects, especially in a high-temperature deposition process, may impart a constraint on an aspect ratio of features that may be achievable using such FMMs; the type and number of patterns that may be achievable using such FMMs may be constrained since, by way of non-limiting example, each part of the FMM will be physically supported so that, in some non-limiting examples, some patterns may not be achievable in a single processing stage, including by way of non-limiting example, where a pattern specifies an isolated feature; FMMs may exhibit a tendency to warp during a high-temperature deposition process, which may, in some non-limiting examples, distort the shape and position of apertures therein, which may cause the selective deposition pattern to be varied, with a degradation in performance and/or yield; FMMs that may be used to produce repeating structures spread across the entire surface of a device **100**, may call for a large number of apertures to be formed in the FMM, which may compromise the structural integrity of the FMM; repeated use of FMMs in successive depositions, especially in a metal deposition process, may cause the deposited material to adhere thereto, which may obfuscate features of the FMM and which may cause the selective deposition pattern to be varied, with a degradation in performance and/or yield; while FMMs may be periodically cleaned to remove adhered non-metallic material, such cleaning procedures may not be suitable for use with adhered metal, and even so, in some non-limiting examples, may be time-consuming and/or expensive; and irrespective of any such cleaning processes, continued use of such FMMs, especially in a high-temperature deposition process, may render them ineffective at producing a desired patterning, at which point they may be discarded and/or replaced, in a complex and expensive process.
(358) FIG. **5** shows an example cross-sectional view of a device **500** that is substantially similar to the device **100**, but further comprises a plurality of raised PDLs **440** across the lateral aspect(s) **420** of non-emissive regions **1920** surrounding the lateral aspect(s) **410** of emissive region(s) **1910** corresponding to (sub-) pixel(s) **340**/**264***x*.
(359) When the conductive coating **830** is deposited, in some non-limiting examples, using an open-mask and/or a mask-free deposition process, the conductive coating **830** is deposited across the lateral aspect(s) **410** of emissive region(s) **1910** corresponding to (sub-) pixel(s) **340**/**264***x* to form (in the figure) the second electrode **140** thereon, and also across the lateral aspect(s) **420** of non-emissive regions **1920** surrounding them, to form regions of conductive coating **830** on top of the PDLs **440**. To ensure that each (segment) of the second electrode **140** is not electrically coupled to any of the at least one conductive region(s) **830**, a thickness of the PDL(s) **440** is greater than a thickness of the second electrode(s) **140**. In some non-limiting examples, the PDL(s) **440** may be provided, as shown in the figure, with an undercut profile to further decrease a likelihood that any (segment) of the second electrode(s) **140** will be electrically coupled to any of the at least one conductive region(s) **830**.
(360) In some non-limiting examples, application of a barrier coating **1650** over the device **500** may result in poor adhesion of the barrier coating **1650** to the device **500**, having regard to the highly non-uniform surface topography of the device **500**.
(361) In some non-limiting examples, it may be desirable to tune optical microcavity effects

associated with sub-pixel(s) **264***x* of different colours (and/or wavelengths) by varying a thickness of the at least one semiconducting layer **130** (and/or a layer thereof) across the lateral aspect **410** of emissive region(s) **1910** corresponding to sub-pixel(s) **264***x* of one colour relative to the lateral aspect **410** of emissive region(s) **1910** corresponding to sub-pixel(s) **264***x* of another colour. In some non-limiting examples, the use of FMMs to perform patterning may not provide a precision called for to provide such optical microcavity tuning effects in at least some cases and/or, in some non-limiting examples, in a production environment for OLED displays **100**.
(362) Nucleation-Inhibiting and/or Promoting Material Properties
(363) In some non-limiting examples, a conductive coating **830**, that may be employed as, or as at least one of a plurality of layers of thin conductive films to form a device feature, including without limitation, at least one of the first electrode **120**, the first electrode **140**, an auxiliary electrode **1750** and/or a busbar **4150** and/or a conductive element electrically coupled thereto, may exhibit a relatively low affinity towards being deposited on an exposed layer surface **111** of an underlying material, so that the deposition of the conductive coating **830** is inhibited.
(364) The relative affinity or lack thereof of a material and/or a property thereof to having a conductive coating **830** deposited thereon may be referred to as being “nucleation-promoting” or “nucleation-inhibiting” respectively.
(365) In the present disclosure, “nucleation-inhibiting” refers to a coating, material and/or a layer thereof that has a surface that exhibits a relatively low affinity for (deposition of) a conductive coating **830** thereon, such that the deposition of the conductive coating **830** on such surface is inhibited.
(366) In the present disclosure, “nucleation-promoting” refers to a coating, material and/or a layer thereof that has a surface that exhibits a relatively high affinity for (deposition of) a conductive coating **830** thereon, such that the deposition of the conductive coating **830** on such surface is facilitated.
(367) The term “nucleation” in these terms references the nucleation stage of a thin film formation process, in which monomers in a vapor phase condense onto the surface to form nuclei.
(368) Without wishing to be bound by a particular theory, it is postulated that the shapes and sizes of such nuclei and the subsequent growth of such nuclei into islands and thereafter into a thin film may depend upon a number of factors, including without limitation, interfacial tensions between the vapor, the surface and/or the condensed film nuclei.
(369) In the present disclosure, such affinity may be measured in a number of fashions.
(370) One measure of a nucleation-inhibiting and/or nucleation-promoting property of a surface is the initial sticking probability S.sub.0 of the surface for a given electrically conductive material, including without limitation, Mg. In the present disclosure, the terms “sticking probability” and “sticking coefficient” may be used interchangeably.
(371) In some non-limiting examples, the sticking probability S may be given by:
(372) $S = \frac{N_{\text{ads}}}{N_{\text{total}}}$
where N.sub.ads is a number of adsorbed monomers (“adatoms”) that remain on an exposed layer surface **111** (that is, are incorporated into a film) and N.sub.total is a total number of impinging monomers on the surface. A sticking probability S equal to 1 indicates that all monomers that impinge on the surface are adsorbed and subsequently incorporated into a growing film. A sticking probability S equal to 0 indicates that all monomers that impinge on the surface are desorbed and subsequently no film is formed on the surface. A sticking probability S of metals on various surface can be evaluated using various techniques of measuring the sticking probability S, including without limitation, a dual quartz crystal microbalance (QCM) technique as described by Walker et al., *J. Phys. Chem. C* 2007, 111, 765 (2006).
(373) As the density of islands increases (e.g., increasing average film thickness), a sticking probability S may change. By way of non-limiting example, a low initial sticking probability S.sub.0 may increase with increasing average film thickness. This can be understood based on a

difference in sticking probability S between an area of a surface with no islands, by way of non-limiting example, a bare substrate **110**, and an area with a high density of islands. By way of non-limiting example, a monomer that impinges on a surface of an island may have a sticking probability S that approaches 1.

(374) An initial sticking probability S.sub.0 may therefore be specified as a sticking probability S of a surface prior to the formation of any significant number of critical nuclei. One measure of an initial sticking probability S.sub.0 can involve a sticking probability S of a surface for a material during an initial stage of deposition of the material, where an average thickness of the deposited material across the surface is at or below a threshold value. In the description of some non-limiting examples a threshold value for an initial sticking probability S.sub.0 can be specified as, by way of non-limiting example, 1 nm. An average sticking probability S may then be given by:

$S=S.\text{sub}.0(1-A.\text{sub}.\text{nuc})+S.\text{sub}.\text{nuc}(A.\text{sub}.\text{nuc})$

where S.sub.nuc is a sticking probability S of an area covered by islands, and A.sub.nuc is a percentage of an area of a substrate surface covered by islands.

(375) Based on the energy profiles **610**, **620**, **630** shown in FIG. **6**, it may be postulated that NIC **810** materials exhibiting relatively low activation energy for desorption (E.sub.des **631**) and/or relatively high activation energy for surface diffusion (E.sub.s **631**) may be particularly advantageous for use in various applications.

(376) One measure of a nucleation-inhibiting and/or nucleation-promoting property of a surface is an initial deposition rate of a given electrically conductive material, including without limitation, Mg, on the surface, relative to an initial deposition rate of the same conductive material on a reference surface, where both surfaces are subjected to and/or exposed to an evaporation flux of the conductive material.

(377) Selective Coatings for Impacting Nucleation-Inhibiting and/or Promoting Material Properties

(378) In some non-limiting examples, one or more selective coatings **710** (FIG. **7**) may be selectively deposited on at least a first portion **701** (FIG. **7**) of an exposed layer surface **111** of an underlying material to be presented for deposition of a thin film conductive coating **830** thereon. Such selective coating(s) **710** have a nucleation-inhibiting property (and/or conversely a nucleation-promoting property) with respect to the conductive coating **830** that differs from that of the exposed layer surface **111** of the underlying material. In some non-limiting examples, there may be a second portion **702** (FIG. **7**) of the exposed layer surface **111** of an underlying material to which no such selective coating(s) **710**, has been deposited.

(379) Such a selective coating **710** may be an NIC **810** and/or a nucleation promoting coating (NPC **1120** (FIG. **11**)).

(380) In some non-limiting examples, the NIC **810** may be disposed on an exposed layer surface **111** of an underlying metallic coating **138**, such as shown by way of non-limiting example, in FIG. **35**. It will be understood by those having ordinary skill in the relevant art that such metallic coating **138** may be (at least) one of the plurality of layers of the device **100**. The metallic coating **138** may be comprised of a metallic coating material. Those having ordinary skill in the relevant art will appreciate that the metallic coating **138** and the metallic coating material of which it is comprised, especially when disposed as a film and under conditions and/or by mechanisms substantially similar to those employed in depositing the second electrode **140**, may exhibit largely similar optical and/or other properties.

(381) In some non-limiting examples, sheet resistance is a property of a component, layer, and/or part that may alter a characteristic of an electric current passing through such component, layer, and/or part. In some non-limiting examples, a sheet resistance R**1** of the metallic coating **138** may generally correspond to a sheet resistance of the metallic coating **138** measured in isolation from other components, layers, and/or parts of the device **100**. In some non-limiting examples, the metallic coating **138** may be formed as a thin film. Accordingly, in some non-limiting examples, the sheet resistance R**1** for the metallic coating **138** may be determined and/or calculated based on

the composition, thickness, and/or morphology of such thin film. In some non-limiting examples, the sheet resistance R**1** may be about 0.1-1,000 Ω/sqr, about 1-100 Ω/sqr, about 2-50 Ω/sqr, about 3-30 Ω/sqr, about 4-20 Ω/sqr, about 5-15 Ω/sqr, and/or about 10-12 Ω/sqr.

(382) In some non-limiting examples, a bond dissociation energy of a metal may correspond to a standard-state enthalpy change measured at 298 K from the breaking of a bond of a diatomic molecule formed by two identical atoms of the metal. Bond dissociation energies may, by way of non-limiting example, be determined based on known literature, including without limitation, Luo, Yu-ran, "Bond dissociation energies" (2010). In some non-limiting examples, the metallic coating material may comprise a metal having a bond dissociation energy of at least 10 kJ/mol, at least 50 kJ/mol, at least 100 kJ/mol, at least 150 kJ/mol, at least 180 kJ/mol, and/or at least 200 kJ/mol.

(383) In some non-limiting examples, the metallic coating material may comprise a metal having an electronegativity that is less than about 1.4, about 1.3, and/or about 1.2.

(384) In some non-limiting examples, the metallic coating material may comprise an element selected from potassium (K), sodium (Na), lithium (Li), barium (Ba), cesium (Cs), ytterbium (Yb), silver (Ag), gold (Au), copper (Cu), aluminum (Al), magnesium (Mg), zinc (Zn), cadmium (Cd), tin (Sn), nickel (Ni), titanium (Ti), palladium (Pd), chromium (Cr), iron (Fe), cobalt (Co), zirconium (Zr), platinum (Pt), vanadium (V), niobium (Nb), iridium (Ir), osmium (Os), tantalum (Ta), molybdenum (Mo), and/or tungsten (W). In some non-limiting examples, the element may comprise Cu, Ag, and/or Au. In some non-limiting examples, the element may be Cu. In some non-limiting examples, the element may be Al. In some non-limiting examples, the element may comprise Mg, Zn, Cd, and/or Yb. In some non-limiting examples, the element may comprise Sn, Ni, Ti, Pd, Cr, Fe, and/or Co. In some non-limiting examples, the element may comprise Zr, Pt, V, Nb, Ir, and/or Os. In some non-limiting examples, the element may comprise Ta, Mo, and/or W. In some non-limiting examples, the element may comprise Mg, Ag, Al, Yb, and/or Li. In some non-limiting examples, the element may comprise Mg, Ag, and/or Yb. In some non-limiting examples, the element may comprise Mg, and/or Ag. In some non-limiting examples, the element may be Ag.

(385) In some non-limiting examples, the metallic coating material may comprise a pure metal. In some non-limiting examples, the metallic coating material is a pure metal. In some non-limiting examples, the metallic coating material is pure Ag or substantially pure Ag. In some non-limiting examples, the metallic coating material is pure Mg or substantially pure Mg. In some non-limiting examples, the metallic coating material is pure Al or substantially pure Al.

(386) In some non-limiting examples, the metallic coating material may comprise an alloy. In some non-limiting examples, the alloy may be an Ag-containing alloy, and/or an AgMg-containing alloy.

(387) In some non-limiting examples, the metallic coating material may comprise other metals in place of, and/or in combination with, Ag. In some non-limiting examples, the metallic coating material may comprise an alloy of Ag with at least one other metal. In some non-limiting examples, the metallic coating material may comprise an alloy of Ag with Mg, and/or Yb. In some non-limiting examples, such alloy may be a binary alloy having a composition from about 5 vol. % Ag to about 95 vol. % Ag, with the remainder being the other metal. In some non-limiting examples, the metallic coating material comprises Ag and Mg. In some non-limiting examples, the metallic coating material comprises an Ag:Mg alloy having a composition from about 1:10 to about 10:1 by volume. In some non-limiting examples, the metallic coating material comprises Ag and Yb. In some non-limiting examples, the metallic coating material comprises a Yb:Ag alloy having a composition from about 1:20 to about 1-10:1 by volume. In some non-limiting examples, the metallic coating material comprises Mg and Yb. In some non-limiting examples, the metallic coating material comprises an Mg:Yb alloy. In some non-limiting examples, the metallic coating material comprises Ag, Mg, and Yb. In some non-limiting examples, the metallic coating material comprises an Ag:Mg:Yb alloy.

(388) In some non-limiting examples, the metallic coating material may comprise oxygen (O). In some non-limiting examples, the metallic coating material may comprise at least one metal and O.

In some non-limiting examples, the metallic coating material may comprise a metal oxide. In some non-limiting examples, the metal oxide comprises Zn, indium (I), tin (Sn), antimony (Sb), and/or gallium (Ga). In some non-limiting examples, the metal oxide may be a transparent conducting oxide (TCO). In some non-limiting examples, the TCO may comprise an indium oxide, tin oxide, antimony oxide, and/or gallium oxide. In some non-limiting examples, the TCO may comprise indium titanium oxide (ITO), ZnO, indium zinc oxide (IZO), and/or indium gallium zinc oxide (IGZO). In some non-limiting examples, the TCO may be electrically doped with other elements.
(389) In some non-limiting example, the metallic coating **138** may be formed by metal and/or metal alloys.
(390) In some non-limiting examples, the metallic coating **138** may comprise at least one metal or metal alloy and at least one metal oxide.
(391) In some non-limiting examples, the metallic coating **138** may comprise a plurality of layers of the metallic coating material. In some non-limiting examples, the metallic coating material of a first one of the plurality of layers may be different from the metallic coating material of a second one of the plurality of layers. In some non-limiting examples, the metallic coating material of the first one of the plurality of layers may comprise a metal and the metallic coating material of the second one of the plurality of layers may comprise a metal oxide.
(392) In some non-limiting examples, the metallic coating material of at least one of the plurality of layers may comprise Yb. In some non-limiting examples, the metallic coating material of one of the plurality of layers may comprise an Ag-containing alloy and/or an AgMg-containing alloy, and/or pure Ag, substantially pure Ag, pure Mg, and/or substantially pure Mg. In some non-limiting examples, the metallic coating **138** is a bilayer Yb/AgMg coating.
(393) In some non-limiting examples, a first one of the plurality of layers that is proximate to the NIC **810** (top-most) may comprise an element selected from Ag, Au, Cu, Al, Sn, Ni, Ti, Pd, Cr, Fe, Co, Zr, Pt, V, Nb, Ir, Os, Ta, Mo, and/or W. In some non-limiting examples, the element may comprise Cu, Ag, and/or Au. In some non-limiting examples, the element may be Cu. In some non-limiting examples, the element may be Al. In some non-limiting examples, the element may comprise Sn, Ti, Pd, Cr, Fe, and/or Co. In some non-limiting examples, the element may comprise Ni, Zr, Pt, V, Nb, Ir, and/or Os. In some non-limiting examples, the element may comprise Ta, Mo, and/or W. In some non-limiting examples, the element may comprise Mg, Ag, and/or Al. In some non-limiting examples, the element may comprise Mg, and/or Ag. In some non-limiting examples, the element may be Ag.
(394) In some non-limiting examples, the metallic coating **138** may comprise at least one additional element. In some non-limiting examples, such additional element may be a non-metallic element. In some non-limiting examples, the non-metallic material may be oxygen (O), sulfur (S), nitrogen (N), and/or carbon C. It will be appreciated by those having ordinary skill in the relevant art that, in some non-limiting examples, such additional element(s) may be incorporated into the metallic coating **138** as a contaminant, due to the presence of such additional element(s) in the source material, equipment used for deposition, and/or the vacuum chamber environment. In some non-limiting examples, the concentration of such additional element(s) may be limited to be below a threshold concentration. In some non-limiting examples, such additional element(s) may form a compound together with other element(s) of the metallic coating **138**. In some non-limiting examples, a concentration of the non-metallic element in the conductive coating material may be less than about 1%, about 0.1%, about 0.001%, about 0.0001%, about 0.00001%, about 0.000001% and/or about 0.0000001%. In some non-limiting examples, the conductive coating **830** has a composition in which a combined amount of 0 and C therein is less than about 10%, about 5%, about 1%, about 0.1%, about 0.001%, about 0.0001%, about 0.00001%, about 0.000001%, and/or about 0.0000001% In some non-limiting examples, the metallic coating **138** may comprise a closed coating **4530**. In some non-limiting examples, the metallic coating **138** may comprise a discontinuous coating **1050**.

(395) In some non-limiting examples, the metallic coating **138** may be disposed in a pattern that may be defined by at least one region therein that is substantially devoid of a closed coating **4530** of the metallic coating **138** on the first layer surface in the first portion **115**. In some non-limiting examples, the at least one region has disposed thereon, a metal patterning NIC **810**. In some non-limiting examples, the at least one region may separate the metallic coating **138** into a plurality of discrete fragments thereof. In some non-limiting examples, at least two of such plurality of discrete fragments of the metallic coating **138** may be electrically coupled. In some non-limiting examples, at least two of such plurality of discrete fragments of the metallic coating **138** may be each electrically coupled to a common conductive layer or coating, including without limitation, the conductive coating **830**, to allow the flow of electric current between them. In some non-limiting examples, at least two of such plurality of discrete fragments of the metallic coating **138** may be electrically insulated from one another.
(396) In the present disclosure, in some non-limiting examples, as the context dictates, the terms “NIC” and “patterning coating” may be used interchangeably to refer to similar concepts, and references to an NIC **810** herein, in the context of being selectively deposited to pattern a conductive coating **830** may, in some non-limiting examples, be applicable to a patterning coating **810** in the context of selective deposition thereof to pattern an electrode coating **830**.
(397) Similarly, in some non-limiting examples, as the context dictates, the term “NPC” and “patterning coating” may be used interchangeably to refer to similar concepts, and reference to an NPC **1120** herein, in the context of being selectively deposited to pattern a conductive coating **830** may, in some non-limiting examples, be applicable to a patterning coating **1120** in the context of selective deposition thereof to pattern an electrode coating **830**.
(398) In some non-limiting examples, reference to a patterning coating **810**, **1120** may signify a coating having a specific composition as described herein.
(399) It will be appreciated by those having ordinary skill in the relevant art that the use of such a selective coating **710** may, in some non-limiting examples, facilitate and/or permit the selective deposition of the conductive coating **830** without employing an FMM during the stage of depositing the conductive coating **830**.
(400) In some non-limiting examples, such selective deposition of the conductive coating **830** may be in a pattern. In some non-limiting examples, such pattern may facilitate providing and/or increasing transmissivity of at least one of the top and/or bottom of the device **100**, within the lateral aspect **410** of one or more emissive region(s) **1910** of a (sub-) pixel **340**/**264***x* and/or within the lateral aspect **420** of one or more non-emissive region(s) **1920** that may, in some non-limiting examples, surround such emissive region(s) **1910**.
(401) In some non-limiting examples, the conductive coating **830** may be deposited on a conductive structure and/or in some non-limiting examples, form a layer thereof, for the device **100**, which in some non-limiting examples may be the first electrode **120** and/or the second electrode **140** to act as one of an anode **341** and/or a cathode **342**, and/or an auxiliary electrode **1750** and/or busbar **4150** to support conductivity thereof and/or in some non-limiting examples, be electrically coupled thereto.
(402) In some non-limiting examples, an NIC **810** for a given conductive coating **830**, including without limitation Mg, may refer to a coating having a surface that exhibits a relatively low initial sticking probability S.sub.0 for the conductive coating **830** (in the example Mg) in vapor form, such that deposition of the conductive coating **830** (in the example Mg) onto the exposed layer surface **111** is inhibited. Thus, in some non-limiting examples, selective deposition of an NIC **810** may reduce an initial sticking probability S.sub.0 of an exposed layer surface **111** (of the NIC **810**) presented for deposition of the conductive coating **830** thereon.
(403) In some non-limiting examples, an NPC **1120**, for a given conductive coating **830**, including without limitation Mg, may refer to a coating having an exposed layer surface **111** that exhibits a relatively high initial sticking probability S.sub.0 for the conductive coating **830** in vapor form,

such that deposition of the conductive coating **830** onto the exposed layer surface **111** is facilitated. Thus, in some non-limiting examples, selective deposition of an NPC **1120** may increase an initial sticking probability S.sub.0 of an exposed layer surface **111** (of the NPC **1120**) presented for deposition of the conductive coating **830** thereon.

(404) When the selective coating **710** is an NIC **810**, the first portion **701** of the exposed layer surface **111** of the underlying material, upon which the NIC **810** is deposited, will thereafter present a treated surface (of the NIC **810**) whose nucleation-inhibiting property has been increased or alternatively, whose nucleation-promoting property has been reduced (in either case, the surface of the NIC **810** deposited on the first portion **701**), such that it has a reduced affinity for deposition of the conductive coating **830** thereon relative to that of the exposed layer surface **111** of the underlying material upon which the NIC **810** has been deposited. By contrast the second portion **702**, upon which no such NIC **810** has been deposited, will continue to present an exposed layer surface **111** (of the underlying substrate **110**) whose nucleation-inhibiting property or alternatively, whose nucleation-promoting property (in either case, the exposed layer surface **111** of the underlying substrate **110** that is substantially devoid of the selective coating **710**), has an affinity for deposition of the conductive coating **830** thereon that has not been substantially altered.

(405) When the selective coating **710** is an NPC **1120**, the first portion **701** of the exposed layer surface **111** of the underlying material, upon which the NPC **1120** is deposited, will thereafter present a treated surface (of the NPC **1120**) whose nucleation-inhibiting property has been reduced or alternatively, whose nucleation-promoting property has been increased (in either case, the surface of the NPC **1120** deposited on the first portion **701**), such that it has an increased affinity for deposition of the conductive coating **830** thereon relative to that of the exposed layer surface **111** of the underlying material upon which the NPC **1120** has been deposited. By contrast, the second portion **702**, upon which no such NPC **1120** has been deposited, will continue to present an exposed layer surface **111** (of the underlying substrate **110**) whose nucleation-inhibiting property or alternatively, whose nucleation-promoting property (in either case, the exposed layer surface **111** of the underlying substrate **110** that is substantially devoid of the NPC **1120**), has an affinity for deposition of the conductive coating **830** thereon that has not been substantially altered.

(406) In some non-limiting examples, both an NIC **810** and an NPC **1120** may be selectively deposited on respective first portions **701** and NPC portions **1103** (FIG. **11**A) of an exposed layer surface **111** of an underlying material to respectively alter a nucleation-inhibiting property (and/or conversely a nucleation-promoting property) of the exposed layer surface **111** to be presented for deposition of a conductive coating **830** thereon. In some non-limiting examples, there may be a second portion **702** of the exposed layer surface **111** of an underlying material to which no selective coating **710** has been deposited, such that the nucleation-inhibiting property (and/or conversely its nucleation-promoting property) to be presented for deposition of the conductive coating **830** thereon is not substantially altered.

(407) In some non-limiting examples, the first portion **701** and NPC portion **1103** may overlap, such that a first coating of an NIC **810** and/or an NPC **1120** may be selectively deposited on the exposed layer surface **111** of the underlying material in such overlapping region and the second coating of the NIC **810** and/or the NPC **1120** may be selectively deposited on the treated exposed layer surface **111** of the first coating. In some non-limiting examples, the first coating is an NIC **810**. In some non-limiting examples, the first coating is an NPC **1120**.

(408) In some non-limiting examples, the first portion **701** (and/or NPC portion **1103**) to which the selective coating **710** has been deposited, may comprise a removal region, in which the deposited selective coating **710** has been removed, to present the uncovered surface of the underlying material for deposition of the conductive coating **830** thereon, such that the nucleation-inhibiting property (and/or conversely its nucleation-promoting property) to be presented for deposition of the conductive coating **830** thereon is not substantially altered.

(409) In some non-limiting examples, the underlying material may be at least one layer selected

from the substrate **110** and/or at least one of the frontplane **10** layers, including without limitation, the first electrode **120**, the second electrode **140**, the at least one semiconducting layer **130** (and/or at least one of the layers thereof) and/or any combination of any of these.
(410) In some non-limiting examples, the conductive coating **830** may have specific material properties. In some non-limiting examples, the conductive coating **830** may comprise Mg, whether alone or in a compound and/or alloy.
(411) By way of non-limiting example, pure and/or substantially pure Mg may not be readily deposited onto some organic surfaces due to a low sticking probability S of Mg on some organic surfaces.
(412) Deposition of Selective Coatings
(413) In some non-limiting examples, a thin film comprising the selective coating **710**, may be selectively deposited and/or processed using a variety of techniques, including without limitation, evaporation (including without limitation), thermal evaporation and/or electron beam evaporation), photolithography, printing (including without limitation, ink jet and/or vapor jet printing, reel-to-reel printing and/or micro-contact transfer printing), PVD (including without limitation, sputtering), CVD (including without limitation, PECVD and/or OVPD), laser annealing, LITI patterning, ALD, coating (including without limitation, spin coating, dip coating, line coating and/or spray coating), and/or combinations of any two or more thereof.
(414) FIG. **7** is an example schematic diagram illustrating a non-limiting example of an evaporative process, shown generally at **700**, in a chamber **70**, for selectively depositing a selective coating **710** onto a first portion **701** of an exposed layer surface **111** of an underlying material (in the figure, for purposes of simplicity of illustration only, the substrate **110**).
(415) In the process **700**, a quantity of a selective coating material **711**, is heated under vacuum, to evaporate and/or sublime **712** the selective coating material **711**. In some non-limiting examples, the selective coating material **711** comprises entirely, and/or substantially, a material used to form the selective coating **710**. Evaporated selective coating material **712** is directed through the chamber **70**, including in a direction indicated by arrow **71**, toward the exposed layer surface **111**. When the evaporated selective coating material **712** is incident on the exposed layer surface **111**, that is, in the first portion **701**, the selective coating **710** is formed thereon.
(416) In some non-limiting examples, as shown in the figure for the process **700**, the selective coating **710** may be selectively deposited only onto a portion, in the example illustrated, the first portion **701**, of the exposed layer surface **111**, by the interposition, between the selective coating material **711** and the exposed layer surface **111**, of a shadow mask **715**, which in some non-limiting examples, may be an FMM. The shadow mask **715** has at least one aperture **716** extending therethrough such that a part of the evaporated selective coating material **712** passes through the aperture **716** and is incident on the exposed layer surface **111** to form the selective coating **710**. Where the evaporated selective coating material **712** does not pass through the aperture **716** but is incident on the surface **717** of the shadow mask **715**, it is precluded from being disposed on the exposed layer surface **111** to form the selective coating **710** within the second portion **703**. The second portion **702** of the exposed layer surface **111** is thus substantially devoid of the selective coating **710**. In some non-limiting examples (not shown), the selective coating material **711** that is incident on the shadow mask **715** may be deposited on the surface **717** thereof.
(417) Accordingly, a patterned surface is produced upon completion of the deposition of the selective coating **710**.
(418) In some non-limiting examples, for purposes of simplicity of illustration, the selective coating **710** employed in FIG. **7** may be an NIC **810**. In some non-limiting examples, for purposes of simplicity of illustration, the selective coating **710** employed in FIG. **7** may be an NPC **1120**.
(419) FIG. **8** is an example schematic diagram illustrating a non-limiting example of a result of an evaporative process, shown generally at **800**, in a chamber **70**, for selectively depositing a conductive coating **830** onto a second portion **702** of an exposed layer surface **111** of an underlying

material (in the figure, for purposes of simplicity of illustration only, the substrate **110**) that is substantially devoid of the NIC **810** that was selectively deposited onto a first portion **701**, including without limitation, by the evaporative process **700** of FIG. **7**. In some non-limiting examples, the second portion **702** comprises that part of the exposed layer surface **111** that lies beyond the first portion **701**.

(420) Once the NIC **810** has been deposited on a first portion **701** of an exposed layer surface **111** of an underlying material (in the figure, the substrate **110**), the conductive coating **830** may be deposited on the second portion **702** of the exposed layer surface **111** that is substantially devoid of the NIC **810**.

(421) In the process **800**, a quantity of a conductive coating material **831**, is heated under vacuum, to evaporate and/or sublime **832** the conductive coating material **831**. In some non-limiting examples, the conductive coating material **831** comprises entirely, and/or substantially, a material used to form the conductive coating **830**. Evaporated conductive coating material **832** is directed inside the chamber **70**, including in a direction indicated by arrow **81**, toward the exposed layer surface **111** of the first portion **701** and of the second portion **702**. When the evaporated conductive coating material **832** is incident on the second portion **702** of the exposed layer surface **111**, the conductive coating **830** is formed thereon.

(422) In some non-limiting examples, deposition of the conductive coating material **831** may be performed using an open mask and/or mask-free deposition process, such that the conductive coating **830** is formed substantially across the entire exposed layer surface **111** of the underlying material (in the figure, the substrate **110**) to produce a treated surface (of the conductive coating **830**).

(423) It will be appreciated by those having ordinary skill in the relevant art that, contrary to that of an FMM, the feature size of an open mask is generally comparable to the size of a device **100** being manufactured. In some non-limiting examples, such an open mask may have an aperture that may generally correspond to a size of the device **100**, which in some non-limiting examples, may correspond, without limitation, to about 1 inch for micro-displays, about 4-6 inches for mobile displays, and/or about 8-17 inches for laptop and/or tablet displays, so as to mask edges of such device **100** during manufacturing. In some non-limiting examples, the feature size of an open mask may be on the order of about 1 cm and/or greater. In some non-limiting examples, an aperture formed in an open mask may in some non-limiting examples be sized to encompass the lateral aspect(s) **410** of a plurality of emissive regions **1910** each corresponding to a (sub-) pixel **340**/**264***x* and/or surrounding and/or the lateral aspect(s) **420** of surrounding and/or intervening non-emissive region(s) **1920**.

(424) It will be appreciated by those having ordinary skill in the relevant art that, in some non-limiting examples, the use of an open mask may be omitted, if desired. In some non-limiting examples, an open mask deposition process described herein may alternatively be conducted without the use of an open mask, such that an entire target exposed layer surface **111** may be exposed.

(425) In some non-limiting examples, as shown in the figure for the process **800**, deposition of the conductive coating **830** may be performed using an open mask and/or mask-free deposition process, such that the conductive coating **830** is formed substantially across the entire exposed layer surface **111** of the underlying material (in the figure, of the substrate **110**) to produce a treated surface (of the conductive coating **830**).

(426) Indeed, as shown in FIG. **8**, the evaporated conductive coating material **832** is incident both on an exposed layer surface **111** of NIC **810** across the first portion **701** as well as the exposed layer surface **111** of the substrate **110** across the second portion **702** that is substantially devoid of NIC **810**.

(427) Since the exposed layer surface **111** of the NIC **810** in the first portion **701** exhibits a relatively low initial sticking probability S.sub.0 for the conductive coating **830** compared to the

exposed layer surface **111** of the substrate **110** in the second portion **702**, the conductive coating **830** is selectively deposited substantially only on the exposed layer surface **111** of the substrate **110** in the second portion **702** that is substantially devoid of the NIC **810**. By contrast, the evaporated conductive coating material **832** incident on the exposed layer surface **111** of NIC **810** across the first portion **701** tends not to be deposited, as shown (**833**) and the exposed layer surface **111** of NIC **810** across the first portion **701** is substantially devoid of the conductive coating **830**. Although not shown in FIG. **8**, in some non-limiting examples, the exposed layer surface **111** of the NIC **810** across the first portion **701** is not substantially devoid of the material of the conductive coating **830** but does not amount to a coating film of the conductive coating **830**. Rather, as discussed in detail later below, the exposed layer surface **111** of the NIC **810** may have a discontinuous coating of the material of the conductive coating **830** deposited thereon and/or an intermediate stage conductive thin film.
(428) In some non-limiting examples, an initial deposition rate of the evaporated conductive coating material **832** on the exposed layer surface **111** of the substrate **110** in the second portion **702** may be at least and/or greater than about 200 times, at least and/or greater than about 550 times, at least and/or greater than about 900 times, at least and/or greater than about 1,000 times, at least and/or greater than about 1,500 times, at least and/or greater than about 1,900 times and/or at least and/or greater than about 2,000 times an initial deposition rate of the evaporated conductive coating material **832** on the exposed layer surface **111** of the NIC **810** in the first portion **701**.
(429) The foregoing may be combined in order to effect the selective deposition of at least one conductive coating **830** to form a device feature, including without limitation, a patterned electrode **120**, **140**, **1750**, **4150** and/or a conductive element electrically coupled thereto, without employing an FMM within the conductive coating **830** deposition process. In some non-limiting examples, such patterning may permit and/or enhance the transmissivity of the device **100**.
(430) In some non-limiting examples, the selective coating **710**, which may be an NIC **810** and/or an NPC **1120** may be applied a plurality of times during the manufacturing process of the device **100**, in order to pattern a plurality of electrodes **120**, **140**, **1750**, **4150** and/or various layers thereof and/or a device feature comprising a conductive coating **830** electrically coupled thereto.
(431) FIGS. **9**A-**9**D illustrate non-limiting examples of open masks.
(432) FIG. **9**A illustrates a non-limiting example of an open mask **900** having and/or defining an aperture **910** formed therein. In some non-limiting examples, such as shown, the aperture **910** of the open mask **900** is smaller than a size of a device **100**, such that when the mask **900** is overlaid on the device **100**, the mask **900** covers edges of the device **100**. In some non-limiting examples, as shown, the lateral aspect(s) **410** of the emissive regions **1910** corresponding to all and/or substantially all of the (sub-) pixel(s) **340**/**264***x* of the device **100** are exposed through the aperture **910**, while an unexposed region **920** is formed between outer edges **91** of the device **100** and the aperture **910**. It will be appreciated by those having ordinary skill in the relevant art that, in some non-limiting examples, electrical contacts and/or other components (not shown) of the device **100** may be located in such unexposed region **920**, such that these components remain substantially unaffected throughout an open mask deposition process.
(433) FIG. **9**B illustrates a non-limiting example of an open mask **901** having and/or defining an aperture **911** formed therein that is smaller than the aperture **910** of FIG. **9**A, such that when the mask **901** is overlaid on the device **100**, the mask **901** covers at least the lateral aspect(s) **410***a* of the emissive region(s) **1910** corresponding to at least some (sub-) pixel(s) **340**/**264***x*. As shown, in some non-limiting examples, the lateral aspect(s) **410***a* of the emissive region(s) **1910** corresponding to outermost (sub-) pixel(s) **340**/**264***x* are located within an unexposed region **913** of the device **100**, formed between the outer edges **91** of the device **100** and the aperture **911**, are masked during an open mask deposition process to inhibit evaporated conductive coating material **832** from being incident on the unexposed region **913**.
(434) FIG. **9**C illustrates a non-limiting example of an open mask **902** having and/or defining an

aperture **912** formed therein defines a pattern that covers the lateral aspect(s) **410***a* of the emissive region(s) **1910** corresponding to at least some (sub-) pixel(s) **340**/**264***x*, while exposing the lateral aspect(s) **410***b* of the emissive region(s) **1910** corresponding to at least some (sub-) pixel(s) **340**/**264***x*. As shown, in some non-limiting examples, the lateral aspect(s) **410***a* of the emissive region(s) **1910** corresponding to at least some (sub-) pixel(s) **340**/**264***x* located within an unexposed region **914** of the device **100**, are masked during an open mask deposition process to inhibit evaporated conductive coating material **830** from being incident on the unexposed region **914**.

(435) While in FIGS. **9**B-**9**C, the lateral aspects **410***a* of the emissive region(s) **1910** corresponding to at least some of the outermost (sub-) pixel(s) **340**/**264***x* have been masked, as illustrated, those having ordinary skill in the relevant art will appreciate that, in some non-limiting examples, an aperture of an open mask **900-902** may be shaped to mask the lateral aspects **410** of other emissive region(s) **1910** and/or the lateral aspects **420** of non-emissive region(s) **1920** of the device **100**.

(436) Furthermore, while FIGS. **9**A-**9**C show open masks **900-902** having a single aperture **910-912**, those having ordinary skill in the relevant art will appreciate that such open masks **900-902** may, in some non-limiting examples (not shown), additional apertures (not shown) for exposing multiple regions of an exposed layer surface **111** of an underlying material of a device **100**.

(437) FIG. **9**D illustrates a non-limiting example of an open mask **903** having and/or defining a plurality of apertures **917***a*-**917***d*. The apertures **917***a*-**917***d* are, in some non-limiting examples, positioned such that they may selectively expose certain regions **921** of the device **100**, while masking other regions **922**. In some non-limiting examples, the lateral aspects **410***b* of certain emissive region(s) **1910** corresponding to at least some (sub-) pixel(s) **340**/**264***x* are exposed through the apertures **917***a*-**917***d* in the regions **921**, while the lateral aspects **410***a* of other emissive region(s) **1910** corresponding to at least one some (sub-) pixel(s) **340**/**264***x* lie within regions **922** and are thus masked.

(438) Turning now to FIG. **10**A there is shown an example version **1000** of the device **100** shown in FIG. **1**, but with a number of additional deposition steps that are described herein.

(439) The device **1000** shows a lateral aspect of the exposed layer surface **111** of the underlying material. The lateral aspect comprises a first portion **1001** and a second portion **1002**. In the first portion **1001**, an NIC **810** is disposed on the exposed layer surface **111**. However, in the second portion **1002**, the exposed layer surface **111** is substantially devoid of the NIC **810**.

(440) In some non-limiting examples, the first portion **1001** and the second portion **1002** are substantially adjacent to one another in a lateral aspect.

(441) In some non-limiting examples, the exposed layer surface **1001** of the first portion **1001** and the exposed layer surface **111** of the second portion **1002** are substantially proximate to one another in a cross-sectional aspect. That is to say, while there may be one or more intervening layers between the exposed layer surface **111** of the first portion **1001** and the exposed layer surface **111** of the second portion **1002**, the difference between them caused thereby is, in some non-limiting examples, a fraction of the lateral extent of at least one of the first portion **1001** and the second portion **1002**.

(442) After selective deposition of the NIC **810** across the first portion **1001**, the conductive coating **830** is deposited over the device **1000**, in some non-limiting examples, using an open mask and/or a mask-free deposition process.

(443) The NIC **810** provides, within the first portion **1001**, a surface with a relatively low initial sticking probability S.sub.0, for the conductive coating **830**, and that is substantially less than the initial sticking probability S.sub.0, for the conductive coating **830**, of the exposed layer surface **111** of the underlying material of the device **1000** within the second portion **1002**.

(444) Thus, the conductive coating **830** is formed as a closed film in the second portion **1002**, while the first portion **1001** is substantially devoid of the conductive coating **830**.

(445) In this fashion, the NIC **810** may be selectively deposited, including using a shadow mask, to allow the conductive coating **830** to be deposited, including without limitation, using an open mask

and/or a mask-free deposition process, so as to form a device feature, including without limitation, at least one of the first electrode **120**, the second electrode **140**, the auxiliary electrode **1750**, a busbar **4150** and/or at least one layer thereof, and/or a conductive element electrically coupled thereto.

(446) Turning now to FIG. **10**B, there is shown an example **1010** of an example version of the device **1000**.

(447) The device **1010** shows, contrary to the device **1000** of FIG. **10**A, in which the first portion **1001** is shown to be substantially devoid of the conductive coating **830**, a first portion **1001** that is substantially devoid of a closed film **4530** of the conductive coating **830**. In FIG. **10**B, due to the presence of the NIC **810** in the first portion **1001**, the conductive coating material **831** is deposited as a discontinuous coating **1050** on an exposed layer surface **1011** of the NIC **810** in the first portion **1001**. In some non-limiting examples, the discontinuous coating **1050** comprises a plurality of discrete islands. In some non-limiting examples, at least some of the islands are disconnected from one another. In other words, in some non-limiting examples, the discontinuous coating **1050** may comprise features that are physically separated from one another, such that the discontinuous coating **1050** does not form a continuous layer.

(448) In this fashion, the NIC **810** may be selectively deposited, including using a shadow mask, to allow the conductive coating **830** to be deposited, including without limitation, using an open mask and/or a mask-free deposition process, so as to form a device feature, including without limitation, at least one of the first electrode **120**, the second electrode **140**, the auxiliary electrode **1750**, a busbar **4150** and/or at least one layer thereof, and/or a conductive element electrically coupled thereto.

(449) Without wishing to be limited to any particular theory, it may be postulated that during the deposition of the conductive coating **830**, some vapor monomers of the conductive coating material **831** impinging on the exposed layer surface **1011** of the NIC **810**, may condense to form small clusters and/or islands thereon. However, substantial growth of such clusters and/or islands, which, if left unimpeded, may lead to possible formation of a substantially closed film **4530** of the conductive coating material **831** on the exposed layer surface **1011** of the NIC **810**, is inhibited due to one or more properties and/or features of the NIC **810**. Accordingly, in some non-limiting examples, the discontinuous coating **1050** comprises the conductive coating material **831** for forming the conductive coating **830**. In some non-limiting examples, a peak absorption wavelength of the discontinuous coating **1050** may be less than a peak wavelength of the photon(s) emitted and/or transmitted by the device **1020**. By way of non-limiting example, the discontinuous coating **1050** may exhibit a peak absorption at a wavelength less than about 470 nm, less than about 460 nm, less than about 455 nm, less than about 450 nm, less than about 445 nm, less than about 440 nm, less than about 430 nm, less than about 420 nm, and/or less than about 400 nm.

(450) In some non-limiting examples, the discontinuous coating **1050** containing the clusters and/or islands may be arranged to be on, and/or in physical contact with, and/or proximate to, the NIC **810**.

(451) FIG. **10**C is a simplified example plan view of the first portion **1001** of the device **1010** according to the non-limiting example of FIG. **10**B.

(452) Turning now to FIG. **10**D, there is shown an example version **1020** of a simplified version of the device **1020** shown in FIG. **10**B, in which there is shown a third portion **1003** arranged between the first portion **1001** and the second portion **1002** in a lateral aspect of the device **1020**. Although not shown as such, in some non-limiting examples, the third portion **1003** may be considered to be a part of the first portion **1001**, representing an extremity thereof and/or an interface with the second portion **1002**. In some non-limiting examples, the third portion **1003** comprises the conductive coating **830** covering at least a portion of the exposed layer surface **1011** of the underlying material, which, in some non-limiting examples, may comprise the NIC **810** in the third portion **1003** as well as the first portion **1001**. In some non-limiting examples, a thickness of the

conductive coating **830** in the third portion **1003** may be less than a thickness of the conductive coating **830** in the second portion **1002**. Although not specifically illustrated in FIG. **10**C, a thickness of the NIC **810** in the third portion **1003** may be less than a thickness of the NIC **810** in the first portion **1001**.

(453) In some non-limiting examples, the conductive coating **830** in the third portion **1003** comprises at least one projection and/or at least one recess in a lateral aspect of the device **1020**. In some non-limiting examples, the conductive coating **830** in the third portion **1003** may comprise an intermediate stage coating, in some non-limiting examples, having a plurality of apertures, including without limitation, pin-holes, tears and/or cracks.

(454) FIG. **10**E is a simplified example plan view of a part of the device **1020**, showing the third portion **1003** arranged between (parts of the first portion **1001** and the second portion **1002**). In some non-limiting examples, the conductive coating **830** in the third portion **1003**, and in some non-limiting examples, encroaching into the first portion **1001** the conductive coating **830** may comprise at least one dendritic projection **1021** that, in some non-limiting examples, may extend laterally toward and/or encroach at least partially into the adjacent first portion **1001**. The at least one dendritic projections **1021** coat the exposed layer surface **1011** of the underlying material, which in some non-limiting examples may be the NIC **810**. In some non-limiting examples, at least one part of the exposed layer surface **1011** of the underlying material, which in some non-limiting examples may be the NIC **810**, may not be covered by the conductive coating **830** in the third portion **1003**, and in some non-limiting examples, extending into the second portion **1002**, may comprise at least one dendritic recess **1022** that, in some non-limiting examples, may extend laterally toward and/or extend at least partially into the adjacent second portion **1002**.

(455) Without wishing to be bound by any particular theory, it may be postulated that at least one projection, including without limitation, the at least one dendritic projections **1021**, and/or at least one recess, including without limitation, the at least one dendritic recesses **1022** may be formed at and/or near and/or because of at least one localized non-uniformity in at least one property and/or feature of the NIC **810**. By way of non-limiting example, at least one localized area of the NIC **810** may exhibit a variation in a critical surface tension, a physical discontinuity in, and/or a domain boundary of a thin film coating thereof. In some non-limiting examples, such variation may be formed between adjacent crystallites and may cause the conductive coating material **831** to be selectively deposited, thus resulting in the at least one projection and/or at least one recess. In some non-limiting examples, the at least one dendritic projection **1021** may comprise at least one feature formed by coalescence of at least one island and/or cluster of the discontinuous coating **1050** with another at least one island and/or cluster of the discontinuous coating **1050** and/or with the conductive coating **830**.

(456) In some non-limiting examples, the third portion **1003** may comprise at least one area that is substantially devoid of the conductive coating material **831**, including without limitation, a gap in the discontinuous coating **1050**, a gap between at least one feature of at least one dendritic projection **1021** and/or at least one feature of at least one dendritic recess **1022**. In some non-limiting examples, a surface coverage of the conductive coating material **831** in the third portion **1003** may be, in some non-limiting examples, between about 30% to about 90%, and/or between about 40% to about 80%.

(457) Thus, the first portion **1001** is substantially devoid of the conductive coating **830**.

(458) In this fashion, the NIC **810** may be selectively deposited, including using a shadow mask, to allow the conductive coating **830** to be deposited, including without limitation, using an open mask and/or a mask-free deposition process, so as to form a device feature, including without limitation, at least one of the first electrode **120**, the second electrode **140**, the auxiliary electrode **1750**, a busbar **4150** and/or at least one layer thereof, and/or a conductive element electrically coupled thereto.

(459) FIGS. **11**A-**11**B illustrate a non-limiting example of an evaporative process, shown generally

at **1100**, in a chamber **70**, for selectively depositing a conductive coating **830** onto a second portion **702** of an exposed layer surface **111** of an underlying material (in the figure, for purposes of simplicity of illustration only, the substrate **110**), that is substantially devoid of the NIC **810** that was selectively deposited onto a first portion **701**, and onto an NPC portion **1103** of the first portion **701**, on which the NIC **810** was deposited, including without limitation, by the evaporative process **700** of FIG. **7**.
(460) FIG. **11**A describes a stage **1101** of the process **1100**, in which, once the NIC **810** has been deposited on the first portion **701** of an exposed layer surface **111** of an underlying material (in the figure, the substrate **110**), the NPC **1120** may be deposited on the NPC portion **1103** of the exposed layer surface **111** of the NIC **810** disposed on the substrate **110** in the first portion **701**. In the figure, by way of non-limiting example, the NPC portion **1103** extends completely within the first portion **701**.
(461) In the stage **1101**, a quantity of an NPC material **1121**, is heated under vacuum, to evaporate and/or sublime **1122** the NPC material **1121**. In some non-limiting examples, the NPC material **1121** comprises entirely, and/or substantially, a material used to form the NPC **1120**. Evaporated NPC material **1122** is directed through the chamber **70**, including in a direction indicated by arrow **1110**, toward the exposed layer surface **111** of the first portion **701** and of the NPC portion **1103**. When the evaporated NPC material **1122** is incident on the NPC portion **1103** of the exposed layer surface **111**, the NPC **1120** is formed thereon.
(462) In some non-limiting examples, deposition of the NPC material **1121** may be performed using an open mask and/or a mask-free deposition technique, such that the NPC **1120** is formed substantially across the entire exposed layer surface **111** of the underlying material (which could be, in the figure, the NIC **810** throughout the first portion **701** and/or the substrate **110** through the second portion **702**) to produce a treated surface (of the NPC **1120**).
(463) In some non-limiting examples, as shown in the figure for the stage **1101**, the NPC **1120** may be selectively deposited only onto a portion, in the example illustrated, the NPC portion **1103**, of the exposed layer surface **111** (in the figure, of the NIC **810**), by the interposition, between the NPC material **1121** and the exposed layer surface **111**, of a shadow mask **1125**, which in some non-limiting examples, may be an FMM. The shadow mask **1125** has at least one aperture **1126** extending therethrough such that a part of the evaporated NPC material **1122** passes through the aperture **1126** and is incident on the exposed layer surface **111** (in the figure, by way of non-limiting example, of the NIC **810** within the NPC portion **1103** only) to form the NPC **1120**. Where the evaporated NPC material **1122** does not pass through the aperture **1126** but is incident on the surface **1127** of the shadow mask **1125**, it is precluded from being disposed on the exposed layer surface **111** to form the NPC **1120**. The portion **1102** of the exposed layer surface **111** that lies beyond the NPC portion **1103**, is thus substantially devoid of the NPC **1120**. In some non-limiting examples (not shown), the evaporated NPC material **1122** that is incident on the shadow mask **1125** may be deposited on the surface **1127** thereof.
(464) While the exposed layer surface **111** of the NIC **810** in the first portion **701** exhibits a relatively low initial sticking probability S.sub.0 for the conductive coating **830**, in some non-limiting examples, this may not necessarily be the case for the NPC coating **1120**, such that the NPC coating **1120** is still selectively deposited on the exposed layer surface (in the figure, of the NIC **810**) in the NPC portion **1103**.
(465) Accordingly, a patterned surface is produced upon completion of the deposition of the NPC **1120**.
(466) FIG. **11**B describes a stage **1104** of the process **1100**, in which, once the NIC **810** has been deposited on the first portion **701** of an exposed layer surface **111** of an underlying material (in the figure, the substrate **110**) and the NPC **1120** has been deposited on the NPC portion **1103** of the exposed layer surface **111** (in the figure, of the NIC **810**), the conductive coating **830** may be deposited on the NPC portion **1103** and the second portion **702** of the exposed layer surface **111** (in

the figure, the substrate **110**).
(467) In the stage **1104**, a quantity of a conductive coating material **831**, is heated under vacuum, to evaporate and/or sublime **832** the conductive coating material **831**. In some non-limiting examples, the conductive coating material **831** comprises entirely, and/or substantially, a material used to form the conductive coating **830**. Evaporated conductive coating material **832** is directed through the chamber **70**, including in a direction indicated by arrow **1120**, toward the exposed layer surface **111** of the first portion **701**, of the NPC portion **1103** and of the second portion **702**. When the evaporated conductive coating material **832** is incident on the NPC portion **1103** of the exposed layer surface **111** (of the NPC **1120**) and on the second portion **702** of the exposed layer surface **111** (of the substrate **110**), that is, other than on the exposed layer surface **111** of the NIC **810**, the conductive coating **830** is formed thereon.
(468) In some non-limiting examples, as shown in the figure for the stage **1104**, deposition of the conductive coating **830** may be performed using an open mask and/or mask-free deposition process, such that the conductive coating **830** is formed substantially across the entire exposed layer surface **111** of the underlying material (other than where the underlying material is the NIC **810**) to produce a treated surface (of the conductive coating **830**).
(469) Indeed, as shown in FIG. **11**B, the evaporated conductive coating material **832** is incident both on an exposed layer surface **111** of NIC **810** across the first portion **701** that lies beyond the NPC portion **1103**, as well as the exposed layer surface **111** of the NPC **1120** across the NPC portion **1103** and the exposed layer surface **111** of the substrate **110** across the second portion **702** that is substantially devoid of NIC **810**.
(470) Since the exposed layer surface **111** of the NIC **810** in the first portion **701** that lies beyond the NPC portion **1103** exhibits a relatively low initial sticking probability S.sub.0 for the conductive coating **830** compared to the exposed layer surface **111** of the substrate **110** in the second portion **702**, and/or since the exposed layer surface **111** of the NPC **1120** in the NPC portion **1103** exhibits a relatively high initial sticking probability S.sub.0 for the conductive coating **830** compared to both the exposed layer surface **111** of the NIC **810** in the first portion **701** that lies beyond the NPC portion **1103** and the exposed layer surface **111** of the substrate **110** in the second portion **702**, the conductive coating **830** is selectively deposited substantially only on the exposed layer surface **111** of the substrate **110** in the NPC portion **1103** and the second portion **702**, both of which are substantially devoid of the NIC **810**. By contrast, the evaporated conductive coating material **832** incident on the exposed layer surface **111** of NIC **810** across the first portion **701** that lies beyond the NPC portion **1103**, tends not to be deposited, as shown (**1123**) and the exposed layer surface **111** of NIC **810** across the first portion **701** that lies beyond the NPC portion **1103** is substantially devoid of the conductive coating **830**.
(471) Accordingly, a patterned surface is produced upon completion of the deposition of the conductive coating **830**.
(472) FIGS. **12**A-**12**C illustrate a non-limiting example of an evaporative process, shown generally at **1200**, in a chamber **70**, for selectively depositing a conductive coating **830** onto a second portion **1202** (FIG. **12**C) of an exposed layer surface **111** of an underlying material.
(473) FIG. **12**A describes a stage **1201** of the process **1200**, in which, a quantity of an NPC material **1121**, is heated under vacuum, to evaporate and/or sublime **1122** the NPC material **1121**. In some non-limiting examples, the NPC material **1121** comprises entirely, and/or substantially, a material used to form the NPC **1120**. Evaporated NPC material **1122** is directed through the chamber **70**, including in a direction indicated by arrow **1210**, toward the exposed layer surface **111** (in the figure, the substrate **110**).
(474) In some non-limiting examples, deposition of the NPC material **1121** may be performed using an open mask and/or mask-free deposition process, such that the NPC **1120** is formed substantially across the entire exposed layer surface **111** of the underlying material (in the figure, the substrate **110**) to produce a treated surface (of the NPC **1120**).

(475) In some non-limiting examples, as shown in the figure for the stage **1201**, the NPC **1120** may be selectively deposited only onto a portion, in the example illustrated, the NPC portion **1103**, of the exposed layer surface **111**, by the interposition, between the NPC material **1121** and the exposed layer surface **111**, of the shadow mask **1125**, which in some non-limiting examples, may be an FMM. The shadow mask **1125** has at least one aperture **1126** extending therethrough such that a part of the evaporated NPC material **1122** passes through the aperture **1126** and is incident on the exposed layer surface **111** to form the NPC **1120** in the NPC portion **1103**. Where the evaporated NPC material **1122** does not pass through the aperture **1126** but is incident on the surface **1127** of the shadow mask **1125**, it is precluded from being disposed on the exposed layer surface **111** to form the NPC **1120** within the portion **1102** of the exposed layer surface **111** that lies beyond the NPC portion **1103**. The portion **1102** is thus substantially devoid of the NPC **1120**. In some non-limiting examples (not shown), the NPC material **1121** that is incident on the shadow mask **1125** may be deposited on the surface **1127** thereof.
(476) When the evaporated NPC material **1122** is incident on the exposed layer surface **111**, that is, in the NPC portion **1103**, the NPC **1120** is formed thereon.
(477) Accordingly, a patterned surface is produced upon completion of the deposition of the NPC **1120**.
(478) FIG. **12**B describes a stage **1202** of the process **1200**, in which, once the NPC **1120** has been deposited on the NPC portion **1103** of an exposed layer surface **111** of an underlying material (in the figure, the substrate **110**), the NIC **810** may be deposited on a first portion **701** of the exposed layer surface **111**. In the figure, by way of non-limiting example, the first portion **701** extends completely within the NPC portion **1103**. As a result, in the figure, by way of non-limiting example, the portion **1102** comprises that portion of the exposed layer surface **111** that lies beyond the first portion **701**.
(479) In the stage **1202**, a quantity of an NIC material **1211**, is heated under vacuum, to evaporate and/or sublime **1212** the NIC material **1211**. In some non-limiting examples, the NIC material **1121** comprises entirely, and/or substantially, a material used to form the NIC **810**. Evaporated NIC material **1212** is directed through the chamber **70**, including in a direction indicated by arrow **1220**, toward the exposed layer surface **111** of the first portion **701**, of the NPC portion **1103** that extends beyond the first portion **701** and of the portion **1102**. When the evaporated NIC material **1212** is incident on the first portion **701** of the exposed layer surface **111**, the NIC **810** is formed thereon.
(480) In some non-limiting examples, deposition of the NIC material **1211** may be performed using an open mask and/or mask-free deposition process, such that the NIC **810** is formed substantially across the entire exposed layer surface **111** of the underlying material to produce a treated surface (of the NIC **810**).
(481) In some non-limiting examples, as shown in the figure for the stage **1202**, the NIC **810** may be selectively deposited only onto a portion, in the example illustrated, the first portion **701**, of the exposed layer surface **111** (in the figure, of the NPC **1120**), by the interposition, between the NIC material **1211** and the exposed layer surface **111**, of a shadow mask **1215**, which in some non-limiting examples, may be an FMM. The shadow mask **1215** has at least one aperture **1216** extending therethrough such that a part of the evaporated NIC material **1212** passes through the aperture **1216** and is incident on the exposed layer surface **111** (in the figure, by way of non-limiting example, of the NPC **1120**) to form the NIC **810**. Where the evaporated NIC material **1212** does not pass through the aperture **1216** but is incident on the surface **1217** of the shadow mask **1215**, it is precluded from being disposed on the exposed layer surface **111** to form the NIC **810** within the second portion **702** beyond the first portion **701**. The second portion **702** of the exposed layer surface **111** that lies beyond the first portion **701**, is thus substantially devoid of the NIC **810**. In some non-limiting examples (not shown), the evaporated NIC material **1212** that is incident on the shadow mask **1215** may be deposited on the surface **1217** thereof.
(482) While the exposed layer surface **111** of the NPC **1120** in the NPC portion **1103** exhibits a

relatively high initial sticking probability S.sub.0 for the conductive coating **830**, in some non-limiting examples, this may not necessarily be the case for the NIC coating **810**. Even so, in some non-limiting examples such affinity for the NIC coating **810** may be such that the NIC coating **810** is still selectively deposited on the exposed layer surface **111** (in the figure, of the NPC **1120**) in the first portion **701**.
(483) Accordingly, a patterned surface is produced upon completion of the deposition of the NIC **810**.
(484) FIG. **12**C describes a stage **1204** of the process **1200**, in which, once the NIC **810** has been deposited on the first portion **701** of an exposed layer surface **111** of an underlying material (in the figure, the NPC **1120**), the conductive coating **830** may be deposited on a second portion **702** of the exposed layer surface **111** (in the figure, of the substrate **110** across the portion **1102** beyond the NPC portion **1103** and of the NPC **1120** across the NPC portion **1103** beyond the first portion **701**).
(485) In the stage **1204**, a quantity of a conductive coating material **831**, is heated under vacuum, to evaporate and/or sublime **832** the conductive coating material **831**. In some non-limiting examples, the conductive coating material **831** comprises entirely, and/or substantially, a material used to form the conductive coating **830**. Evaporated conductive coating material **832** is directed through the chamber **70**, including in a direction indicated by arrow **1230**, toward the exposed layer surface **111** of the first portion **701**, of the NPC portion **1103** and of the portion **1102** beyond the NPC portion **1103**. When the evaporated conductive coating material **832** is incident on the NPC portion **1103** of the exposed layer surface **111** (of the NPC **1120**) beyond the first portion **701** and on the portion **1102** beyond the NPC portion **1103** of the exposed layer surface **111** (of the substrate **110**), that is, on the second portion **702** other than on the exposed layer surface **111** of the NIC **810**, the conductive coating **830** is formed thereon.
(486) In some non-limiting examples, as shown in the figure for the stage **1204**, deposition of the conductive coating **830** may be performed using an open mask and/or mask-free deposition process, such that the conductive coating **830** is formed substantially across the entire exposed layer surface **111** of the underlying material (other than where the underlying material is the NIC **810**) to produce a treated surface (of the conductive coating **830**).
(487) Indeed, as shown in FIG. **12**C, the evaporated conductive coating material **832** is incident both on an exposed layer surface **111** of NIC **810** across the first portion **701** that lies within the NPC portion **1103**, as well as the exposed layer surface **111** of the NPC **1120** across the NPC portion **1103** that lies beyond the first portion **701** and the exposed layer surface **111** of the substrate **110** across the portion **1102** that lies beyond the NPC portion **1103**.
(488) Since the exposed layer surface **111** of the NIC **810** in the first portion **701** exhibits a relatively low initial sticking probability S.sub.0 for the conductive coating **830** compared to the exposed layer surface **111** of the substrate **110** in the second portion **702** that lies beyond the NPC portion **1103**, and/or since the exposed layer surface **111** of the NPC **1120** in the NPC portion **1103** that lies beyond the first portion **701** exhibits a relatively high initial sticking probability S.sub.0 for the conductive coating **830** compared to both the exposed layer surface **111** of the NIC **810** in the first portion **701** and the exposed layer surface **111** of the substrate **110** in the portion **1102** that lies beyond the NPC portion **1103**, the conductive coating **830** is selectively deposited substantially only on the exposed layer surface **111** of the substrate **110** in the NPC portion **1103** that lies beyond the first portion **701** and on the portion **1102** that lies beyond the NPC portion **1103**, both of which are substantially devoid of the NIC **810**. By contrast, the evaporated conductive coating material **832** incident on the exposed layer surface **111** of NIC **810** across the first portion **701**, tends not to be deposited, as shown (**1233**) and the exposed layer surface **111** of NIC **810** across the first portion **701** is substantially devoid of the conductive coating **830**.
(489) Accordingly, a patterned surface is produced upon completion of the deposition of the conductive coating **830**.
(490) In some non-limiting examples, an initial deposition rate of the evaporated conductive

coating material **832** on the exposed layer surface **111** in the second portion **702** may be at least and/or greater than about 200 times, at least and/or greater than about 550 times, at least and/or greater than about 900 times, at least and/or greater than about 1,000 times, at least and/or greater than about 1,500 times, at least and/or greater than about 1,900 times and/or at least and/or greater than about 2,000 times an initial deposition rate of the evaporated conductive coating material **832** on the exposed layer surface **111** of the NIC **810** in the first portion **701**.

(491) FIGS. **13**A-**13**C illustrate a non-limiting example of a printing process, shown generally at **1300**, for selectively depositing a selective coating **710**, which in some non-limiting examples may be an NIC **810** and/or an NPC **1120**, onto an exposed layer surface **111** of an underlying material (in the figure, for purposes of simplicity of illustration only, the substrate **110**).

(492) FIG. **13**A describes a stage of the process **1300**, in which a stamp **1310** having a protrusion **1311** thereon is provided with the selective coating **710** on an exposed layer surface **1312** of the protrusion **1311**. Those having ordinary skill in the relevant art will appreciate that the selective coating **710** may be deposited and/or deposited on the protrusion surface **1312** using a variety of suitable mechanisms.

(493) FIG. **13**B describes a stage of the process **1300**, in which the stamp **1310** is brought into proximity **1301** with the exposed layer surface **111**, such that the selective coating **710** comes into contact with the exposed layer surface **111** and adheres thereto.

(494) FIG. **13**C describes a stage of the process **1300**, in which the stamp **1310** is moved away **1303** from the exposed layer surface **111**, leaving the selective coating **710** deposited on the exposed layer surface **111**.

(495) Selective Deposition of a Patterned Electrode

(496) The foregoing may be combined in order to effect the selective deposition of at least one conductive coating **830** to form a patterned electrode **120**, **140**, **1750**, **4150**, which may, in some non-limiting examples, may be the second electrode **140** and/or an auxiliary electrode **1750**, without employing an FMM within the high-temperature conductive coating **830** deposition process. In some non-limiting examples, such patterning may permit and/or enhance the transmissivity of the device **100**.

(497) FIG. **14** shows an example patterned electrode **1400** in plan view, in the figure, the second electrode **140** suitable for use in an example version **1500** (FIG. **15**) of the device **100**. The electrode **1400** is formed in a pattern **1410** that comprises a single continuous structure, having or defining a patterned plurality of apertures **1420** therewithin, in which the apertures **1420** correspond to regions of the device **100** where there is no cathode **342**.

(498) In the figure, by way of non-limiting example, the pattern **1410** is disposed across the entire lateral extent of the device **1500**, without differentiation between the lateral aspect(s) **410** of emissive region(s) **1910** corresponding to (sub-) pixel(s) **340**/**264***x* and the lateral aspect(s) **420** of non-emissive region(s) **1920** surrounding such emissive region(s) **1910**. Thus, the example illustrated may correspond to a device **1500** that is substantially transmissive relative to light incident on an external surface thereof, such that a substantial part of such externally-incident light may be transmitted through the device **1500**, in addition to the emission (in a top-emission, bottom-emission and/or double-sided emission) of photons generated internally within the device **1500** as disclosed herein.

(499) The transmittivity of the device **1500** may be adjusted and/or modified by altering the pattern **1410** employed, including without limitation, an average size of the apertures **1420**, and/or a spacing and/or density of the apertures **1420**.

(500) Turning now to FIG. **15**, there is shown a cross-sectional view of the device **1500**, taken along line **15-15** in FIG. **14**. In the figure, the device **1500** is shown as comprising the substrate **110**, the first electrode **120** and the at least one semiconducting layer **130**. In some non-limiting examples, an NPC **1120** is disposed on substantially all of the exposed layer surface **111** of the at least one semiconducting layer **130**. In some non-limiting examples, the NPC **1120** could be

omitted.
(501) An NIC **810** is selectively disposed in a pattern substantially corresponding to the pattern **1410** on the exposed layer surface **111** of the underlying material, which, as shown in the figure, is the NPC **1120** (but, in some non-limiting examples, could be the at least one semiconducting layer **130** if the NPC **1120** has been omitted).
(502) A conductive coating **830** suitable for forming the patterned electrode **1400**, which in the figure is the second electrode **140**, is disposed on substantially all of the exposed layer surface **111** of the underlying material, using an open mask and/or a mask-free deposition process, neither of which employs any FMM during the high-temperature conductive coating deposition process. The underlying material comprises both regions of the NIC **810**, disposed in the pattern **1410**, and regions of NPC **1120**, in the pattern **1410** where the NIC **810** has not been deposited. In some non-limiting examples, the regions of the NIC **810** may correspond substantially to a first portion comprising the apertures **1420** shown in the pattern **1410**.
(503) Because of the nucleation-inhibiting properties of those regions of the pattern **1410** where the NIC **810** was disposed (corresponding to the apertures **1420**), the conductive coating **830** disposed on such regions tends not to remain, resulting in a pattern of selective deposition of the conductive coating **830**, that corresponds substantially to the remainder of the pattern **1410**, leaving those regions of the first portion of the pattern **1410** corresponding to the apertures **1420** substantially devoid of the conductive coating **830**.
(504) In other words, the conductive coating **830** that will form the cathode **342** is selectively deposited substantially only on a second portion comprising those regions of the NPC **1120** that surround but do not occupy the apertures **1420** in the pattern **1410**.
(505) FIG. **16**A shows, in plan view, a schematic diagram showing a plurality of patterns **1620**, **1640** of electrodes **120**, **140**, **1750**.
(506) In some non-limiting examples, the first pattern **1620** comprises a plurality of elongated, spaced-apart regions that extend in a first lateral direction. In some non-limiting examples, the first pattern **1620** may comprise a plurality of first electrodes **120**. In some non-limiting examples, a plurality of the regions that comprise the first pattern **1620** may be electrically coupled.
(507) In some non-limiting examples, the second pattern **1640** comprises a plurality of elongated, spaced-apart regions that extend in a second lateral direction. In some non-limiting examples, the second lateral direction may be substantially normal to the first lateral direction. In some non-limiting examples, the second pattern **1640** may comprise a plurality of second electrodes **140**. In some non-limiting examples, a plurality of the regions that comprise the second pattern **1640** may be electrically coupled.
(508) In some non-limiting examples, the first pattern **1620** and the second pattern **1640** may form part of an example version, shown generally at **1600** (FIG. **16**C) of the device **100**, which may comprise a plurality of PMOLED elements.
(509) In some non-limiting examples, the lateral aspect(s) **410** of emissive region(s) **1910** corresponding to (sub-) pixel(s) **340**/**264***x* are formed where the first pattern **1620** overlaps the second pattern **1640**. In some non-limiting examples, the lateral aspect(s) **420** of non-emissive region **1920** correspond to any lateral aspect other than the lateral aspect(s) **410**.
(510) In some non-limiting examples, a first terminal, which, in some non-limiting examples, may be a positive terminal, of the power source **15**, is electrically coupled to at least one electrode **120**, **140**, **1750** of the first pattern **1620**. In some non-limiting examples, the first terminal is coupled to the at least one electrode **120**, **140**, **1750** of the first pattern **1620** through at least one driving circuit **300**. In some non-limiting examples, a second terminal, which, in some non-limiting examples, may be a negative terminal, of the power source **15**, is electrically coupled to at least one electrode **120**, **140**, **1750** of the second pattern **1640**. In some non-limiting examples, the second terminal is coupled to the at least one electrode **120**, **140**, **1750** of the second pattern **1740** through the at least one driving circuit **300**.

(511) Turning now to FIG. **16**B, there is shown a cross-sectional view of the device **1600**, at a deposition stage **1600***b*, taken along line **16**B-**16**B in FIG. **16**A. In the figure, the device **1600** at the stage **1600***b* is shown as comprising the substrate **110**. In some non-limiting examples, an NPC **1120** is disposed on the exposed layer surface **111** of the substrate **110**. In some non-limiting examples, the NPC **1120** could be omitted.
(512) An NIC **810** is selectively disposed in a pattern substantially corresponding to the inverse of the first pattern **1620** on the exposed layer surface **111** of the underlying material, which, as shown in the figure, is the NPC **1120**.
(513) A conductive coating **830** suitable for forming the first pattern **1620** of electrodes **120**, **140**, **1750**, which in the figure is the first electrode **120**, is disposed on substantially all of the exposed layer surface **111** of the underlying material, using an open mask and/or a mask-free deposition process, neither of which employs any FMM during the high-temperature conductive coating deposition process. The underlying material comprises both regions of the NIC **810**, disposed in the inverse of the first pattern **1620**, and regions of NPC **1120**, disposed in the first pattern **1620** where the NIC **810** has not been deposited. In some non-limiting examples, the regions of the NPC **1120** may correspond substantially to the elongated spaced-apart regions of the first pattern **1620**, while the regions of the NIC **810** may correspond substantially to a first portion comprising the gaps therebetween.
(514) Because of the nucleation-inhibiting properties of those regions of the first pattern **1620** where the NIC **810** was disposed (corresponding to the gaps therebetween), the conductive coating **830** disposed on such regions tends not to remain, resulting in a pattern of selective deposition of the conductive coating **830**, that corresponds substantially to elongated spaced-apart regions of the first pattern **1620**, leaving a first portion comprising the gaps therebetween substantially devoid of the conductive coating **830**.
(515) In other words, the conductive coating **830** that will form the first pattern **1620** of electrodes **120**, **140**, **1750** is selectively deposited substantially only on a second portion comprising those regions of the NPC **1120** (or in some non-limiting examples, the substrate **110** if the NPC **1120** has been omitted), that define the elongated spaced-apart regions of the first pattern **1620**.
(516) Turning now to FIG. **16**C, there is shown a cross-sectional view of the device **1600**, taken along line **16**C-**16**C in FIG. **16**A. In the figure, the device **1600** is shown as comprising the substrate **110**; the first pattern **1620** of electrodes **120** deposited as shown in FIG. **16**B, and the at least one semiconducting layer(s) **130**.
(517) In some non-limiting examples, the at least one semiconducting layer(s) **130** may be provided as a common layer across substantially all of the lateral aspect(s) of the device **1600**.
(518) In some non-limiting examples, an NPC **1120** is disposed on substantially all of the exposed layer surface **111** of the at least one semiconducting layer **130**. In some non-limiting examples, the NPC **1120** could be omitted.
(519) An NIC **810** is selectively disposed in a pattern substantially corresponding to the second pattern **1640** on the exposed layer surface **111** of the underlying material, which, as shown in the figure, is the NPC **1120** (but, in some non-limiting examples, could be the at least one semiconducting layer **130** if the NPC **1120** has been omitted).
(520) A conductive coating **830** suitable for forming the second pattern **1640** of electrodes **120**, **140**, **1750**, which in the figure is the second electrode **140**, is disposed on substantially all of the exposed layer surface **111** of the underlying material, using an open mask and/or a mask-free deposition process, neither of which employs any FMM during the high-temperature conductive coating deposition process. The underlying material comprises both regions of the NIC **810**, disposed in the inverse of the second pattern **1640**, and regions of NPC **1120**, in the second pattern **1640** where the NIC **810** has not been deposited. In some non-limiting examples, the regions of the NPC **1120** may correspond substantially to a first portion comprising the elongated spaced-apart regions of the second pattern **1640**, while the regions of the NIC **810** may correspond substantially

to the gaps therebetween.

(521) Because of the nucleation-inhibiting properties of those regions of the second pattern **1640** where the NIC **810** was disposed (corresponding to the gaps therebetween), the conductive coating **830** disposed on such regions tends not to remain, resulting in a pattern of selective deposition of the conductive coating **830**, that corresponds substantially to elongated spaced-apart regions of the second pattern **1640**, leaving the first portion comprising the gaps therebetween substantially devoid of the conductive coating **830**.

(522) In other words, the conductive coating **830** that will form the second pattern **1640** of electrodes **120**, **140**, **1750** is selectively deposited substantially only on a second portion comprising those regions of the NPC **1120** that define the elongated spaced-apart regions of the second pattern **1640**.

(523) In some non-limiting examples, a thickness of the NIC **810** and of the conductive coating **830** deposited thereafter for forming either or both of the first pattern **1620** and/or the second pattern **1640** of electrodes **120**, **140**, **1750**, may be varied according to a variety of parameters, including without limitation, a desired application and desired performance characteristics. In some non-limiting examples, the thickness of the NIC **810** may be comparable to and/or substantially less than a thickness of conductive coating **830** deposited thereafter. Use of a relatively thin NIC **810** to achieve selective patterning of a conductive coating deposited thereafter may be suitable to provide flexible devices **1600**, including without limitation, PMOLED devices. In some non-limiting examples, a relatively thin NIC **810** may provide a relatively planar surface on which the barrier coating **1650** or other thin film encapsulation (TFE) layer, may be deposited. In some non-limiting examples, providing such a relatively planar surface for application of the barrier coating **1650** may increase adhesion of the barrier coating **1650** to such surface.

(524) At least one of the first pattern **1620** of electrodes **120**, **140**, **1750** and at least one of the second pattern **1640** of electrodes **120**, **140**, **1750** may be electrically coupled to the power source **15**, whether directly and/or, in some non-limiting examples, through their respective driving circuit(s) **300** to control photon emission from the lateral aspect(s) **410** of the emissive region(s) **1910** corresponding to (sub-) pixel(s) **340**/**264***x*.

(525) Those having ordinary skill in the relevant art will appreciate that the process of forming the second electrode **140** in the second pattern **1640** shown in FIGS. **16**A-**16**C may, in some non-limiting examples, be used in similar fashion to form an auxiliary electrode **1750** for the device **1600**. In some non-limiting examples, the second electrode **140** thereof may comprise a common electrode, and the auxiliary electrode **1750** may be deposited in the second pattern **1640**, in some non-limiting examples, above or in some non-limiting examples below, the second electrode **140** and electrically coupled thereto. In some non-limiting examples, the second pattern **1640** for such auxiliary electrode **1750** may be such that the elongated spaced-apart regions of the second pattern **1640** lie substantially within the lateral aspect(s) **420** of non-emissive region(s) **1920** surrounding the lateral aspect(s) **410** of emissive region(s) **1910** corresponding to (sub-) pixel(s) **340**/**264***x*. In some non-limiting examples, the second pattern **1640** for such auxiliary electrodes **1750** may be such that the elongated spaced-apart regions of the second pattern **1640** lie substantially within the lateral aspect(s) **410** of emissive region(s) **1910** corresponding to (sub-) pixel(s) **340**/**264***x* and/or the lateral aspect(s) **420** of non-emissive region(s) **1920** surrounding them.

(526) FIG. **17** shows an example cross-sectional view of an example version **1700** of the device **100** that is substantially similar thereto, but further comprises at least one auxiliary electrode **1750** disposed in a pattern above and electrically coupled (not shown) with the second electrode **140**.

(527) The auxiliary electrode **1750** is electrically conductive. In some non-limiting examples, the auxiliary electrode **1750** may be formed by at least one metal and/or metal oxide. Non-limiting examples of such metals include Cu, Al, molybdenum (Mo) and/or Ag. By way of non-limiting examples, the auxiliary electrode **1750** may comprise a multi-layer metallic structure, including without limitation, one formed by Mo/Al/Mo. Non-limiting examples of such metal oxides include

ITO, ZnO, IZO and/or other oxides containing In and/or Zn. In some non-limiting examples, the auxiliary electrode **1750** may comprise a multi-layer structure formed by a combination of at least one metal and at least one metal oxide, including without limitation, Ag/ITO, Mo/ITO, ITO/Ag/ITO and/or ITO/Mo/ITO. In some non-limiting examples, the auxiliary electrode **1750** comprises a plurality of such electrically conductive materials.

(528) The device **1700** is shown as comprising the substrate **110**, the first electrode **120** and the at least one semiconducting layer **130**.

(529) In some non-limiting examples, an NPC **1120** is disposed on substantially all of the exposed layer surface **111** of the at least one semiconducting layer **130**. In some non-limiting examples, the NPC **1120** could be omitted.

(530) The second electrode **140** is disposed on substantially all of the exposed layer surface **111** of the NPC **1120** (or the at least one semiconducting layer **130**, if the NPC **1120** has been omitted).

(531) In some non-limiting examples, particularly in a top-emission device **1700**, the second electrode **140** may be formed by depositing a relatively thin conductive film layer (not shown) in order, by way of non-limiting example, to reduce optical interference (including, without limitation, attenuation, reflections and/or diffusion) related to the presence of the second electrode **140**. In some non-limiting examples, as discussed elsewhere, a reduced thickness of the second electrode **140**, may generally increase a sheet resistance of the second electrode **140**, which may, in some non-limiting examples, reduce the performance and/or efficiency of the device **1700**. By providing the auxiliary electrode **1750** that is electrically coupled to the second electrode **140**, the sheet resistance and thus, the IR drop associated with the second electrode **140**, may, in some non-limiting examples, be decreased.

(532) In some non-limiting examples, the device **1700** may be a bottom-emission and/or double-sided emission device **1700**. In such examples, the second electrode **140** may be formed as a relatively thick conductive layer without substantially affecting optical characteristics of such a device **1700**. Nevertheless, even in such scenarios, the second electrode **140** may nevertheless be formed as a relatively thin conductive film layer (not shown), by way of non-limiting example, so that the device **1700** may be substantially transmissive relative to light incident on an external surface thereof, such that a substantial part such externally-incident light may be transmitted through the device **1700**, in addition to the emission of photons generated internally within the device **1700** as disclosed herein.

(533) An NIC **810** is selectively disposed in a pattern on the exposed layer surface **111** of the underlying material, which, as shown in the figure, is the NPC **1120**. In some non-limiting examples, as shown in the figure, the NIC **810** may be disposed, in a first portion of the pattern, as a series of parallel rows **1720**.

(534) A conductive coating **830** suitable for forming the patterned auxiliary electrode **1750**, is disposed on substantially all of the exposed layer surface **111** of the underlying material, using an open mask and/or a mask-free deposition process, neither of which employs any FMM during the high-temperature conductive coating deposition process. The underlying material comprises both regions of the NIC **810**, disposed in the pattern of rows **1720**, and regions of NPC **1120** where the NIC **810** has not been deposited.

(535) Because of the nucleation-inhibiting properties of those rows **1720** where the NIC **810** was disposed, the conductive coating **830** disposed on such rows **1720** tends not to remain, resulting in a pattern of selective deposition of the conductive coating **830**, that corresponds substantially to at least one second portion of the pattern, leaving the first portion comprising the rows **1720** substantially devoid of the conductive coating **830**.

(536) In other words, the conductive coating **830** that will form the auxiliary electrode **1750** is selectively deposited substantially only on a second portion comprising those regions of the NPC **1120**, that surround but do not occupy the rows **1720**.

(537) In some non-limiting examples, selectively depositing the auxiliary electrode **1750** to cover

only certain rows **1720** of the lateral aspect of the device **1700**, while other regions thereof remain uncovered, may control and/or reduce optical interference related to the presence of the auxiliary electrode **1750**.

(538) In some non-limiting examples, the auxiliary electrode **1750** may be selectively deposited in a pattern that cannot be readily detected by the naked eye from a typical viewing distance.

(539) In some non-limiting examples, the auxiliary electrode **1750** may be formed in devices other than OLED devices, including for decreasing an effective resistance of the electrodes of such devices.

(540) Auxiliary Electrode

(541) The ability to pattern electrodes **120**, **140**, **1750**, **4150** including without limitation, the second electrode **140** and/or the auxiliary electrode **1750** without employing FMMs during the high-temperature conductive coating **830** deposition process by employing a selective coating **710**, including without limitation, the process depicted in FIG. **17**, allows numerous configurations of auxiliary electrodes **1750** to be deployed.

(542) FIG. **18**A shows, in plan view, a part of an example version **1800** of the device **100** having a plurality of emissive regions **1910***a*-**1910***j* and at least one non-emissive region **1820** surrounding them. In some non-limiting examples, the device **1800** may be an AMOLED device in which each of the emissive regions **1910***a*-**1910***j* corresponds to a (sub-) pixel **340**/**264***x* thereof.

(543) FIGS. **18**B-**18**D show examples of a part of the device **1800** corresponding to neighbouring emissive regions **1910***a* and **1910***b* thereof and a part of the at least one non-emissive region **1820** therebetween, in conjunction with different configurations **1750***b*-**1750***d* of an auxiliary electrode **1750** overlaid thereon. In some non-limiting examples, while not expressly illustrated in FIGS. **18**B-**18**D, the second electrode **140** of the device **1800**, is understood to substantially cover at least both emissive regions **1910***a* and **1910***b* thereof and the part of the at least one non-emissive region **1820** therebetween.

(544) In FIG. **18**B, the auxiliary electrode configuration **1750***b* is disposed between the two neighbouring emissive regions **1910***a* and **1910***b* and electrically coupled to the second electrode **140**. In this example, a width a of the auxiliary electrode configuration **1750***b* is less than a separation distance δ between the neighbouring emissive regions **1910***a* and **1910***b*. As a result, there exists a gap within the at least one non-emissive region **1820** on each side of the auxiliary electrode configuration **1750***b*. In some non-limiting examples, such an arrangement may reduce a likelihood that the auxiliary electrode configuration **1750***b* would interfere with an optical output of the device **1800**, in some non-limiting examples, from at least one of the emissive regions **1910***a* and **1910***b*. In some non-limiting examples, such an arrangement may be appropriate where the auxiliary electrode configuration **1750***b* is relatively thick (in some non-limiting examples, greater than several hundred nm and/or on the order of a few microns in thickness). In some non-limiting examples, a ratio of a height (thickness) of the auxiliary electrode configuration **1750***b* a width thereof ("aspect ratio") may be greater than about 0.05, such as about 0.1 or greater, about 0.2 or greater, about 0.5 or greater, about 0.8 or greater, about 1 or greater, and/or about 2 or greater. By way of non-limiting example, a height (thickness) of the auxiliary electrode configuration **1750***b* may be greater than about 50 nm, such as about 80 nm or greater, about 100 nm or greater, about 200 nm or greater, about 500 nm or greater, about 700 nm or greater, about 1000 nm or greater, about 1500 nm or greater, about 1700 nm or greater, or about 2000 nm or greater.

(545) In FIG. **18**C, the auxiliary electrode configuration **1750***c* is disposed between the two neighbouring emissive regions **1910***a* and **1910***b* and electrically coupled to the second electrode **140**. In this example, the width a of the auxiliary electrode configuration **1750***c* is substantially the same as the separation distance δ between the neighbouring emissive regions **1910***a* and **1910***b*. As a result, there is no gap within the at least one non-emissive region **1820** on either side of the auxiliary electrode configuration **1750***c*. In some non-limiting examples, such an arrangement may be appropriate where the separation distance δ between the neighbouring emissive regions **1910***a*

and **1910***b* is relatively small, by way of non-limiting example, in a high pixel density device **1800**.
(546) In FIG. **18**D, the auxiliary electrode **1750***d* is disposed between the two neighbouring emissive regions **1910***a* and **1910***b* and electrically coupled to the second electrode **140**. In this example, the width a of the auxiliary electrode configuration **1750***d* is greater than the separation distance δ between the neighbouring emissive regions **1910***a* and **1910***b*. As a result, a part of the auxiliary electrode configuration **1750***d* overlaps a part of at least one of the neighbouring emissive regions **1910***a* and/or **1910***b*. While the figure shows that the extent of overlap of the auxiliary electrode configuration **1750***d* with each of the neighbouring emissive regions **1910***a* and **1910***b*, in some non-limiting examples, the extent of overlap and/or in some non-limiting examples, a profile of overlap between the auxiliary electrode configuration **1750***d* and at least one of the neighbouring emissive regions **1910***a* and **1910***b* may be varied and/or modulated.
(547) FIG. **19** shows, in plan view, a schematic diagram showing an example of a pattern **1950** of the auxiliary electrode **1750** formed as a grid that is overlaid over both the lateral aspects **410** of emissive regions **1910**, which may correspond to (sub-) pixel(s) **340**/**264***x* of an example version **1900** of device **100**, and the lateral aspects **420** of non-emissive regions **1920** surrounding the emissive regions **1910**.
(548) In some non-limiting examples, the auxiliary electrode pattern **1950** extends substantially only over some but not all of the lateral aspects **420** of non-emissive regions **1920**, so as not to substantially cover any of the lateral aspects **410** of the emissive regions **1910**.
(549) Those having ordinary skill in the relevant art will appreciate that while, in the figure, the auxiliary electrode pattern **1950** is shown as being formed as a continuous structure such that all elements thereof are both physically connected and electrically coupled with one another and electrically coupled to at least one electrode **120**, **140**, **1750**, **4150**, which in some non-limiting examples may be the first electrode **120** and/or the second electrode **140**, in some non-limiting examples, the auxiliary electrode pattern **1950** may be provided as a plurality of discrete elements of the auxiliary electrode pattern **1950** that, while remaining electrically coupled to one another, are not physically connected to one another. Even so, such discrete elements of the auxiliary electrode pattern **1950** may still substantially lower a sheet resistance of the at least one electrode **120**, **140**, **1750**, **4150** with which they are electrically coupled, and consequently of the device **1900**, so as to increase an efficiency of the device **1900** without substantially interfering with its optical characteristics.
(550) In some non-limiting examples, auxiliary electrodes **1750** may be employed in devices **100** with a variety of arrangements of (sub-) pixel(s) **340**/**264***x*. In some non-limiting examples, the (sub-) pixel **340**/**264***x* arrangement may be substantially diamond-shaped.
(551) By way of non-limiting example, FIG. **20**A shows, in plan view, in an example version **2000** of device **100**, a plurality of groups **2041**-**2043** of emissive regions **1910** each corresponding to a sub-pixel **264***x*, surrounded by the lateral aspects of a plurality of non-emissive regions **1920** comprising PDLs **440** in a diamond configuration. In some non-limiting examples, the configuration is defined by patterns **2041**-**2043** of emissive regions **1910** and PDLs **440** in an alternating pattern of first and second rows.
(552) In some non-limiting examples, the lateral aspects **420** of the non-emissive regions **1920** comprising PDLs **440** may be substantially elliptically-shaped. In some non-limiting examples, the major axes of the lateral aspects **420** of the non-emissive regions **1920** in the first row are aligned and substantially normal to the major axes of the lateral aspects **420** of the non-emissive regions **1920** in the second row. In some non-limiting examples, the major axes of the lateral aspects **420** of the non-emissive regions **1920** in the first row are substantially parallel to an axis of the first row.
(553) In some non-limiting examples, a first group **2041** of emissive regions **1910** correspond to sub-pixels **264***x* that emit light at a first wavelength, in some non-limiting examples the sub-pixels **264***x* of the first group **2041** may correspond to red (R) sub-pixels **2641**. In some non-limiting examples, the lateral aspects **410** of the emissive regions **1910** of the first group **2041** may have a

substantially diamond-shaped configuration. In some non-limiting examples, the emissive regions **1910** of the first group **2041** lie in the pattern of the first row, preceded and followed by PDLs **440**. In some non-limiting examples, the lateral aspects **410** of the emissive regions **1910** of the first group **2041** slightly overlap the lateral aspects **420** of the preceding and following non-emissive regions **1920** comprising PDLs **440** in the same row, as well as of the lateral aspects **420** of adjacent non-emissive regions **1920** comprising PDLs **440** in a preceding and following pattern of the second row.

(554) In some non-limiting examples, a second group **2042** of emissive regions **1910** correspond to sub-pixels **264***x* that emit light at a second wavelength, in some non-limiting examples the sub-pixels **264***x* of the second group **2042** may correspond to green (G) sub-pixels **2642**. In some non-limiting examples, the lateral aspects **410** of the emissive regions **1910** of the second group **2041** may have a substantially elliptical configuration. In some non-limiting examples, the emissive regions **1910** of the second group **2041** lie in the pattern of the second row, preceded and followed by PDLs **440**. In some non-limiting examples, the major axis of some of the lateral aspects **410** of the emissive regions **1910** of the second group **2041** may be at a first angle, which in some non-limiting examples, may be 45° relative to an axis of the second row. In some non-limiting examples, the major axis of others of the lateral aspects **410** of the emissive regions **1910** of the second group **2041** may be at a second angle, which in some non-limiting examples may be substantially normal to the first angle. In some non-limiting examples, the emissive regions **1910** of the first group **2041**, whose lateral aspects **410** have a major axis at the first angle, alternate with the emissive regions **1910** of the first group **2041**, whose lateral aspects **410** have a major axis at the second angle.

(555) In some non-limiting examples, a third group **2043** of emissive regions **1910** correspond to sub-pixels **264***x* that emit light at a third wavelength, in some non-limiting examples the sub-pixels **264***x* of the third group **2043** may correspond to blue (B) sub-pixels **2643**. In some non-limiting examples, the lateral aspects **410** of the emissive regions **1910** of the third group **2043** may have a substantially diamond-shaped configuration. In some non-limiting examples, the emissive regions **1910** of the third group **2043** lie in the pattern of the first row, preceded and followed by PDLs **440**. In some non-limiting examples, the lateral aspects **410** of the emissive regions **1910** of the third group **2043** slightly overlap the lateral aspects **410** of the preceding and following non-emissive regions **1920** comprising PDLs **440** in the same row, as well as of the lateral aspects **420** of adjacent non-emissive regions **1920** comprising PDLs **440** in a preceding and following pattern of the second row. In some non-limiting examples, the pattern of the second row comprises emissive regions **1910** of the first group **2041** alternating emissive regions **1910** of the third group **2043**, each preceded and followed by PDLs **440**.

(556) Turning now to FIG. **20**B, there is shown an example cross-sectional view of the device **2000**, taken along line **20**B-**20**B in FIG. **20**A. In the figure, the device **2000** is shown as comprising a substrate **110** and a plurality of elements of a first electrode **120**, formed on an exposed layer surface **111** thereof. The substrate **110** may comprise the base substrate **112** (not shown for purposes of simplicity of illustration) and/or at least one TFT structure **200**, corresponding to and for driving each sub-pixel **264***x*. PDLs **440** are formed over the substrate **110** between elements of the first electrode **120**, to define emissive region(s) **1910** over each element of the first electrode **120**, separated by non-emissive region(s) **1920** comprising the PDL(s) **440**. In the figure, the emissive region(s) **1910** all correspond to the second group **2042**.

(557) In some non-limiting examples, at least one semiconducting layer **130** is deposited on each element of the first electrode **120**, between the surrounding PDLs **440**.

(558) In some non-limiting examples, a second electrode **140**, which in some non-limiting examples, may be a common cathode, may be deposited over the emissive region(s) **1910** of the second group **2042** to form the G(reen) sub-pixel(s) **2642** thereof and over the surrounding PDLs **440**.

(559) In some non-limiting examples, an NIC **810** is selectively deposited over the second electrode **140** across the lateral aspects **410** of the emissive region(s) **1910** of the second group **2042** of G(reen) sub-pixels **2642** to allow selective deposition of a conductive coating **830** over parts of the second electrode **140** that is substantially devoid of the NIC **810**, namely across the lateral aspects **420** of the non-emissive region(s) **1920** comprising the PDLs **440**. In some non-limiting examples, the conductive coating **830** may tend to accumulate along the substantially planar parts of the PDLs **440**, as the conductive coating **830** may not tend to remain on the inclined parts of the PDLs **440**, but tends to descend to a base of such inclined parts, which are coated with the NIC **810**. In some non-limiting examples, the conductive coating **830** on the substantially planar parts of the PDLs **440** may form at least one auxiliary electrode **1750** that may be electrically coupled to the second electrode **140**.
(560) In some non-limiting examples, the device **2000** may comprise a CPL **3610** and/or an outcoupling layer. By way of non-limiting example, such CPL **3610** and/or outcoupling layer may be provided directly on a surface of the second electrode **140** and/or a surface of the NIC **810**. In some non-limiting examples, such CPL **3610** and/or outcoupling layer may be provided across the lateral aspect **410** of at least one emissive region **1910** corresponding to a (sub-) pixel **340**/**264***x*.
(561) In some non-limiting examples, the NIC **810** may also act as an index-matching coating. In some non-limiting examples, the NIC **810** may also act as an outcoupling layer.
(562) In some non-limiting examples, the device **2000** comprises an encapsulation layer. Non-limiting examples of such encapsulation layer include a glass cap, a barrier film, a barrier adhesive and/or a TFE layer **2050** such as shown in dashed outline in the figure, provided to encapsulate the device **2000**. In some non-limiting examples, the TFE layer **2050** may be considered a type of barrier coating **1650**.
(563) In some non-limiting examples, the encapsulation layer may be arranged above at least one of the second electrode **140** and/or the NIC **810**. In some non-limiting example, the device **2000** comprises additional optical and/or structural layers, coatings and components, including without limitation, a polarizer, a color filter, an anti-reflection coating, an anti-glare coating, cover class and/or an optically-clear adhesive (OCA).
(564) Turning now to FIG. **20**C, there is shown an example cross-sectional view of the device **2000**, taken along line **20**C-**20**C in FIG. **20**A. In the figure, the device **2000** is shown as comprising a substrate **110** and a plurality of elements of a first electrode **120**, formed on an exposed layer surface **111** thereof. PDLs **440** are formed over the substrate **110** between elements of the first electrode **120**, to define emissive region(s) **1910** over each element of the first electrode **120**, separated by non-emissive region(s) **1920** comprising the PDL(s) **440**. In the figure, the emissive region(s) **1910** correspond to the first group **2041** and to the third group **2043** in alternating fashion.
(565) In some non-limiting examples, at least one semiconducting layer **130** is deposited on each element of the first electrode **120**, between the surrounding PDLs **440**.
(566) In some non-limiting examples, a second electrode **140**, which in some non-limiting examples, may be a common cathode, may be deposited over the emissive region(s) **1910** of the first group **2041** to form the R(ed) sub-pixel(s) **2641** thereof, over the emissive region(s) **1910** of the third group **2043** to form the B(lue) sub-pixel(s) **2643** thereof, and over the surrounding PDLs **440**.
(567) In some non-limiting examples, an NIC **810** is selectively deposited over the second electrode **140** across the lateral aspects **410** of the emissive region(s) **1910** of the first group **2041** of R(ed) sub-pixels **2641** and of the third group of B(lue) sub-pixels **2643** to allow selective deposition of a conductive coating **830** over parts of the second electrode **140** that is substantially devoid of the NIC **810**, namely across the lateral aspects **420** of the non-emissive region(s) **1920** comprising the PDLs **440**. In some non-limiting examples, the conductive coating **830** may tend to accumulate along the substantially planar parts of the PDLs **440**, as the conductive coating **830** may not tend to remain on the inclined parts of the PDLs **440**, but tends to descend to a base of

such inclined parts, which are coated with the NIC **810**. In some non-limiting examples, the conductive coating **830** on the substantially planar parts of the PDLs **440** may form at least one auxiliary electrode **1750** that may be electrically coupled to the second electrode **140**.
(568) Turning now to FIG. **21**, there is shown an example version **2100** of the device **100**, which encompasses the device **100** shown in cross-sectional view in FIG. **4**, but with a number of additional deposition steps that are described herein.
(569) The device **2100** shows an NIC **810** selectively deposited over the exposed layer surface **111** of the underlying material, in the figure, the second electrode **140**, within a first portion of the device **2100**, corresponding substantially to the lateral aspect **410** of emissive region(s) **1910** corresponding to (sub-) pixel(s) **340**/**264***x* and not within a second portion of the device **2100**, corresponding substantially to the lateral aspect(s) **420** of non-emissive region(s) **1920** surrounding the first portion.
(570) In some non-limiting examples, the NIC **810** may be selectively deposited using a shadow mask.
(571) The NIC **810** provides, within the first portion, a surface with a relatively low initial sticking probability S.sub.0 for a conductive coating **830** to be thereafter deposited on to form an auxiliary electrode **1750**.
(572) After selective deposition of the NIC **810**, the conductive coating **830** is deposited over the device **2100** but remains substantially only within the second portion, which is substantially devoid of NIC **810**, to form the auxiliary electrode **1750**.
(573) In some non-limiting examples, the conductive coating **830** may be deposited using an open mask and/or a mask-free deposition process.
(574) The auxiliary electrode **1750** is electrically coupled to the second electrode **140** so as to reduce a sheet resistance of the second electrode **140**, including, as shown, by lying above and in physical contact with the second electrode **140** across the second portion that is substantially devoid of NIC **810**.
(575) In some non-limiting examples, the conductive coating **830** may comprise substantially the same material as the second electrode **140**, to ensure a high initial sticking probability S.sub.0 for the conductive coating **830** in the second portion.
(576) In some non-limiting examples, the second electrode **140** may comprise substantially pure Mg and/or an alloy of Mg and another metal, including without limitation, Ag. In some non-limiting examples, an Mg:Ag alloy composition may range from about 1:9 to about 9:1 by volume. In some non-limiting examples, the second electrode **140** may comprise metal oxides, including without limitation, ternary metal oxides, such as, without limitation, ITO and/or IZO, and/or a combination of metals and/or metal oxides.
(577) In some non-limiting examples, the conductive coating **830** used to form the auxiliary electrode **1750** may comprise substantially pure Mg.
(578) Turning now to FIG. **22**, there is shown an example version **2200** of the device **100**, which encompasses the device **100** shown in cross-sectional view in FIG. **4**, but with a number of additional deposition steps that are described herein.
(579) The device **2200** shows an NIC **810** selectively deposited over the exposed layer surface **111** of the underlying material, in the figure, the second electrode **140**, within a first portion of the device **2200**, corresponding substantially to a part of the lateral aspect **410** of emissive region(s) **1910** corresponding to (sub-) pixel(s) **340**/**264***x*, and not within a second portion. In the figure, the first portion extends partially along the extent of an inclined part of the PDLs **440** defining the emissive region(s) **1910**.
(580) In some non-limiting examples, the NIC **810** may be selectively deposited using a shadow mask.
(581) The NIC **810** provides, within the first portion, a surface with a relatively low initial sticking probability S.sub.0 for a conductive coating **830** to be thereafter deposited on form an auxiliary

electrode **1750**.

(582) After selective deposition of the NIC **810**, the conductive coating **830** is deposited over the device **2200** but remains substantially only within the second portion, which is substantially devoid of NIC **810**, to form the auxiliary electrode **1750**. As such, in the device **2200**, the auxiliary electrode **1750** extends partly across the inclined part of the PDLs **440** defining the emissive region(s) **1910**.

(583) In some non-limiting examples, the conductive coating **830** may be deposited using an open mask and/or a mask-free deposition process.

(584) The auxiliary electrode **1750** is electrically coupled to the second electrode **140** so as to reduce a sheet resistance of the second electrode **140**, including, as shown, by lying above and in physical contact with the second electrode **140** across the second portion that is substantially devoid of NIC **810**.

(585) In some non-limiting examples, the material of which the second electrode **140** may be comprised, may not have a high initial sticking probability S.sub.0 for the conductive coating **830**.

(586) FIG. **23** illustrates such a scenario, in which there is shown an example version **2300** of the device **100**, which encompasses the device **100** shown in cross-sectional view in FIG. **4**, but with a number of additional deposition steps that are described herein.

(587) The device **2300** shows an NPC **1120** deposited over the exposed layer surface **111** of the underlying material, in the figure, the second electrode **140**.

(588) In some non-limiting examples, the NPC **1120** may be deposited using an open mask and/or a mask-free deposition process.

(589) Thereafter, an NIC **810** is deposited selectively deposited over the exposed layer surface **111** of the underlying material, in the figure, the NPC **1120**, within a first portion of the device **2300**, corresponding substantially to a part of the lateral aspect **410** of emissive region(s) **1910** corresponding to (sub-) pixel(s) **340**/**264***x*, and not within a second portion of the device **2300**, corresponding substantially to the lateral aspect(s) **420** of non-emissive region(s) **1920** surrounding the first portion.

(590) In some non-limiting examples, the NIC **810** may be selectively deposited using a shadow mask.

(591) The NIC **810** provides, within the first portion, a surface with a relatively low initial sticking probability S.sub.0 for a conductive coating **830** to be thereafter deposited on form an auxiliary electrode **1750**.

(592) After selective deposition of the NIC **810**, the conductive coating **830** is deposited over the device **2300** but remains substantially only within the second portion, which is substantially devoid of NIC **810**, to form the auxiliary electrode **1750**.

(593) In some non-limiting examples, the conductive coating **830** may be deposited using an open mask and/or a mask-free deposition process.

(594) The auxiliary electrode **1750** is electrically coupled to the second electrode **140** so as to reduce a sheet resistance thereof. While, as shown, the auxiliary electrode **1750** is not lying above and in physical contact with the second electrode **140**, those having ordinary skill in the relevant art will nevertheless appreciate that the auxiliary electrode **1750** may be electrically coupled to the second electrode **140** by a number of well-understood mechanisms. By way of non-limiting example, the presence of a relatively thin film (in some non-limiting examples, of up to about 50 nm) of an NIC **810** and/or an NPC **1120** may still allow a current to pass therethrough, thus allowing a sheet resistance of the second electrode **140** to be reduced.

(595) Turning now to FIG. **24**, there is shown an example version **2400** of the device **100**, which encompasses the device **100** shown in cross-sectional view in FIG. **4**, but with a number of additional deposition steps that are described herein.

(596) The device **2400** shows an NIC **810** deposited over the exposed layer surface **111** of the underlying material, in the figure, the second electrode **140**.

(597) In some non-limiting examples, the NIC **810** may be deposited using an open mask and/or a mask-free deposition process.
(598) The NIC **810** provides a surface with a relatively low initial sticking probability S.sub.0 for a conductive coating **830** to be thereafter deposited on form an auxiliary electrode **1750**.
(599) After deposition of the NIC **810**, an NPC **1120** is selectively deposited over the exposed layer surface **111** of the underlying material, in the figure, the NIC **810**, within a NPC portion of the device **2400**, corresponding substantially to a part of the lateral aspect **420** of non-emissive region(s) **1920** surrounding a second portion of the device **2400**, corresponding substantially to the lateral aspect(s) **410** of emissive region(s) **1910** corresponding to (sub-) pixel(s) **340**/**264***x*.
(600) In some non-limiting examples, the NPC **1120** may be selectively deposited using a shadow mask.
(601) The NPC **1120** provides, within the first portion, a surface with a relatively high initial sticking probability S.sub.0 for a conductive coating **830** to be thereafter deposited on form an auxiliary electrode **1750**.
(602) After selective deposition of the NPC **1120**, the conductive coating **830** is deposited over the device **2400** but remains substantially only within the NPC portion, in which the NIC **810** has been overlaid with the NPC **1120**, to form the auxiliary electrode **1750**.
(603) In some non-limiting examples, the conductive coating **830** may be deposited using an open mask and/or a mask-free deposition process.
(604) The auxiliary electrode **1750** is electrically coupled to the second electrode **140** so as to reduce a sheet resistance of the second electrode **140**.
(605) Removal of Selective Coatings
(606) In some non-limiting examples, the NIC **810** may be removed subsequent to deposition of the conductive coating **830**, such that at least a part of a previously exposed layer surface **111** of an underlying material covered by the NIC **810** may become exposed once again. In some non-limiting examples, the NIC **810** may be selectively removed by etching and/or dissolving the NIC **810** and/or by employing plasma and/or solvent processing techniques that do not substantially affect or erode the conductive coating **830**.
(607) Turning now to FIG. **25**A, there is shown an example cross-sectional view of an example version **2500** of the device **100**, at a deposition stage **2500***a*, in which an NIC **810** has been selectively deposited on a first portion of an exposed layer surface **111** of an underlying material. In the figure, the underlying material may be the substrate **110**.
(608) In FIG. **25**B, the device **2500** is shown at a deposition stage **2500***b*, in which a conductive coating **830** is deposited on the exposed layer surface **111** of the underlying material, that is, on both the exposed layer surface **111** of NIC **810** where the NIC **810** has been deposited during the stage **2500***a*, as well as the exposed layer surface **111** of the substrate **110** where that NIC **810** has not been deposited during the stage **2500***a*. Because of the nucleation-inhibiting properties of the first portion where the NIC **810** was disposed, the conductive coating **830** disposed thereon tends not to remain, resulting in a pattern of selective deposition of the conductive coating **830**, that corresponds to a second portion, leaving the first portion substantially devoid of the conductive coating.
(609) In FIG. **25**C, the device **2500** is shown at a deposition stage **2500***c*, in which the NIC **810** has been removed from the first portion of the exposed layer surface **111** of the substrate **110**, such that the conductive coating **830** deposited during the stage **2500***b* remains on the substrate **110** and regions of the substrate **110** on which the NIC **810** had been deposited during the stage **2500***a* are now exposed or uncovered.
(610) In some non-limiting examples, the removal of the NIC **810** in the stage **2500***c* may be effected by exposing the device **2500** to a solvent and/or a plasma that reacts with and/or etches away the NIC **810** without substantially impacting the conductive coating **830**.
(611) Transparent OLED

(612) Turning now to FIG. **26**A, there is shown an example plan view of a transmissive (transparent) version, shown generally at **2600**, of the device **100**. In some non-limiting examples, the device **2600** is an AMOLED device having a plurality of pixel regions **2610** and a plurality of transmissive regions **2620**. In some non-limiting examples, at least one auxiliary electrode **1750** may be deposited on an exposed layer surface **111** of an underlying material between the pixel region(s) **2610** and/or the transmissive region(s) **2620**.

(613) In some non-limiting examples, each pixel region **2610** may comprise a plurality of emissive regions **1910** each corresponding to a sub-pixel **264***x*. In some non-limiting examples, the sub-pixels **264***x* may correspond to, respectively, R(ed) sub-pixels **2641**, G(reen) sub-pixels **2642** and/or B(lue) sub-pixels **2643**.

(614) In some non-limiting examples, each transmissive region **2620** is substantially transparent and allows light to pass through the entirety of a cross-sectional aspect thereof.

(615) Turning now to FIG. **26**B, there is shown an example cross-sectional view of the device **2600**, taken along line **26**B-**26**B in FIG. **26**A. In the figure, the device **2600** is shown as comprising a substrate **110**, a TFT insulating layer **280** and a first electrode **120** formed on a surface of the TFT insulating layer **280**. The substrate **110** may comprise the base substrate **112** (not shown for purposes of simplicity of illustration) and/or at least one TFT structure **200**, corresponding to and for driving each sub-pixel **264***x* positioned substantially thereunder and electrically coupled to the first electrode **120** thereof. PDL(s) **440** are formed in non-emissive regions **1920** over the substrate **110**, to define emissive region(s) **1910** also corresponding to each sub-pixel **264***x*, over the first electrode **120** corresponding thereto. The PDL(s) **440** cover edges of the first electrode **120**.

(616) In some non-limiting examples, at least one semiconducting layer **130** is deposited over exposed region(s) of the first electrode **120** and, in some non-limiting examples, at least parts of the surrounding PDLs **440**.

(617) In some non-limiting examples, a second electrode **140** may be deposited over the at least one semiconducting layer(s) **130**, including over the pixel region **2610** to form the sub-pixel(s) **264***x* thereof and, in some non-limiting examples, at least partially over the surrounding PDLs **440** in the transmissive region **2620**.

(618) In some non-limiting examples, an NIC **810** is selectively deposited over first portion(s) of the device **2600**, comprising both the pixel region **2610** and the transmissive region **2620** but not the region of the second electrode **140** corresponding to the auxiliary electrode **1750**.

(619) In some non-limiting examples, the entire surface of the device **2600** is then exposed to a vapor flux of the conductive coating **830**, which in some non-limiting examples may be Mg. The conductive coating **830** is selectively deposited over second portion(s) of the second electrode **140** that is substantially devoid of the NIC **810** to form an auxiliary electrode **1750** that is electrically coupled to and in some non-limiting examples, in physical contact with uncoated parts of the second electrode **140**.

(620) At the same time, the transmissive region **2620** of the device **2600** remains substantially devoid of any materials that may substantially affect the transmission of light therethrough. In particular, as shown in the figure, the TFT structure **200** and the first electrode **120** are positioned, in a cross-sectional aspect, below the sub-pixel **264***x* corresponding thereto, and together with the auxiliary electrode **1750**, lie beyond the transmissive region **2620**. As a result, these components do not attenuate or impede light from being transmitted through the transmissive region **2620**. In some non-limiting examples, such arrangement allows a viewer viewing the device **2600** from a typical viewing distance to see through the device **2600**, in some non-limiting examples, when all of the (sub-) pixel(s) **340**/**264***x* are not emitting, thus creating a transparent AMOLED device **2600**.

(621) While not shown in the figure, in some non-limiting examples, the device **2600** may further comprise an NPC **1120** disposed between the auxiliary electrode **1750** and the second electrode **140**. In some non-limiting examples, the NPC **1120** may also be disposed between the NIC **810** and the second electrode **140**.

(622) In some non-limiting examples, the NIC **810** may be formed concurrently with the at least one semiconducting layer(s) **130**. By way of non-limiting example, at least one material used to form the NIC **810** may also be used to form the at least one semiconducting layer(s) **130**. In such non-limiting example, a number of stages for fabricating the device **2600** may be reduced.
(623) Those having ordinary skill in the relevant art will appreciate that in some non-limiting examples, various other layers and/or coatings, including without limitation those forming the at least one semiconducting layer(s) **130** and/or the second electrode **140**, may cover a part of the transmissive region **2620**, especially if such layers and/or coatings are substantially transparent. In some non-limiting examples, the PDL(s) **440** may have a reduced thickness, including without limitation, by forming a well therein, which in some non-limiting examples is not dissimilar to the well defined for emissive region(s) **1910**, to further facilitate light transmission through the transmissive region **2620**.
(624) Those having ordinary skill in the relevant art will appreciate that (sub-) pixel(s) **340**/**264***x* arrangements other than the arrangement shown in FIGS. **26**A and **26**B may, in some non-limiting examples, be employed.
(625) Those having ordinary skill in the relevant art will appreciate that arrangements of the auxiliary electrode(s) **1750** other than the arrangement shown in FIGS. **26**A and **26**B may, in some non-limiting examples, be employed. By way of non-limiting example, the auxiliary electrode(s) **1750** may be disposed between the pixel region **2610** and the transmissive region **2620**. By way of non-limiting example, the auxiliary electrode(s) **1750** may be disposed between sub-pixel(s) **264***x* within a pixel region **2610**.
(626) Turning now to FIG. **27**A, there is shown an example plan view of a transparent version, shown generally at **2700** of the device **100**. In some non-limiting examples, the device **2700** is an AMOLED device having a plurality of pixel regions **2610** and a plurality of transmissive regions **2620**. The device **2700** differs from device **2600** in that no auxiliary electrode(s) **1750** lie between the pixel region(s) **2610** and/or the transmissive region(s) **2620**.
(627) In some non-limiting examples, each pixel region **2610** may comprise a plurality of emissive regions **1910** each corresponding to a sub-pixel **264***x*. In some non-limiting examples, the sub-pixels **264***x* may correspond to, respectively, R(ed) sub-pixels **2641**, G(reen) sub-pixels **2642** and/or B(lue) sub-pixels **2643**.
(628) In some non-limiting examples, each transmissive region **2620** is substantially transparent and allows light to pass through the entirety of a cross-sectional aspect thereof.
(629) Turning now to FIG. **27**B, there is shown an example cross-sectional view of the device **2700**, taken along line **27**B-**27**B in FIG. **27**A. In the figure, the device **2700** is shown as comprising a substrate **110**, a TFT insulating layer **280** and a first electrode **120** formed on a surface of the TFT insulating layer **280**. The substrate **110** may comprise the base substrate **112** (not shown for purposes of simplicity of illustration) and/or at least one TFT structure **200** corresponding to and for driving each sub-pixel **264***x* positioned substantially thereunder and electrically coupled to the first electrode **120** thereof. PDL(s) **440** are formed in non-emissive regions **1920** over the substrate **110**, to define emissive region(s) **1910** also corresponding to each sub-pixel **264***x*, over the first electrode **120** corresponding thereto. The PDL(s) **440** cover edges of the first electrode **120**.
(630) In some non-limiting examples, at least one semiconducting layer **130** is deposited over exposed region(s) of the first electrode **120** and, in some non-limiting examples, at least parts of the surrounding PDLs **440**.
(631) In some non-limiting examples, an initial conductive coating **830**.sub.0 may be deposited over the at least one semiconducting layer(s) **130**, including over the pixel region **2610** to form the sub-pixel(s) **264***x* thereof and over the surrounding PDLs **440** in the transmissive region **2620**. In some non-limiting examples, the thickness of the initial conductive coating **830**.sub.0 may be relatively thin such that the presence of the initial conductive coating **830**.sub.0 across the transmissive region **2620** does not substantially attenuate transmission of light therethrough. In

some non-limiting examples, the initial conductive coating **830**.sub.0 may be deposited using an open mask and/or mask-free deposition process.
(632) In some non-limiting examples, an NIC **810** is selectively deposited over first portions of the device **2700**, comprising the transmissive region **2620**.
(633) In some non-limiting examples, the entire surface of the device **2700** is then exposed to a vapor flux of the conductive coating material **831**, which in some non-limiting examples may be Mg, to selectively deposit a first conductive coating **830***a* over second portion(s) of the initial conductive coating **830**.sub.0 that are substantially devoid of the NIC **810**, in some examples, the pixel region **2610**, such that the first conductive coating **830***a* is electrically coupled to and in some non-limiting examples, in physical contact with uncoated parts of the initial conductive coating **830**.sub.0, to form the second electrode **140**.
(634) In some non-limiting examples, a thickness of the initial conductive coating **830**.sub.0 may be less than a thickness of the first conductive coating **830***a*. In this way, relatively high transmittance may be maintained in the transmissive region **2620**, over which only the initial conductive coating **830**.sub.0 extends. In some non-limiting examples, the thickness of the initial conductive coating **830**.sub.0 may be less than about 30 nm, less than about 25 nm, less than about 20 nm, less than about 15 nm, less than about 10 nm, less than about 8 nm, and/or less than about 5 nm. In some non-limiting examples, the thickness of the first conductive coating **830***a* may be less than about 30 nm, less than about 25 nm, less than about 20 nm, less than about 15 nm, less than about 10 nm and/or less than about 8 nm.
(635) Thus, in some non-limiting examples, a thickness of the second electrode **140** may be less than about 40 nm, and/or in some non-limiting examples, between about 5 nm and 30 nm, between about 10 nm and about 25 nm and/or between about 15 nm and about 25 nm.
(636) In some non-limiting examples, the thickness of the initial conductive coating **830**.sub.0 may be greater than the thickness of the first conductive coating **830***a*. In some non-limiting examples, the thickness of the initial conductive coating **830**.sub.0 and the thickness of the first conductive coating **830***a* may be substantially the same.
(637) In some non-limiting examples, at least one material used to form the initial conductive coating **830**.sub.0 may be substantially the same as at least one material used to form the first conductive coating **830***a*. In some non-limiting examples, such at least one material may be substantially as described herein in respect of the first electrode **120**, the second electrode **140**, the auxiliary electrode **1750** and/or a conductive coating **830** thereof.
(638) In some non-limiting examples, the transmissive region **2620** of the device **2700** remains substantially devoid of any materials that may substantially affect the transmission of light therethrough. In particular, as shown in the figure, the TFT structure **200** and/or the first electrode **120** are positioned, in a cross-sectional aspect below the sub-pixel **264***x* corresponding thereto and beyond the transmissive region **2620**. As a result, these components do not attenuate or impede light from being transmitted through the transmissive region **2620**. In some non-limiting examples, such arrangement allows a viewer viewing the device **2700** from a typical viewing distance to see through the device **2700**, in some non-limiting examples, when all of the (sub-) pixel(s) **340**/**264***x* are not emitting, thus creating a transparent AMOLED device **2700**.
(639) While not shown in the figure, in some non-limiting examples, the device **2700** may further comprise an NPC **1120** disposed between the first conductive coating **830***a* and the initial conductive coating **830**.sub.0. In some non-limiting examples, the NPC **1120** may also be disposed between the NIC **810** and the initial conductive coating **830**.sub.0.
(640) In some non-limiting examples, the NIC **810** may be formed concurrently with the at least one semiconducting layer(s) **130**. By way of non-limiting example, at least one material used to form the NIC **810** may also be used to form the at least one semiconducting layer(s) **130**. In such non-limiting example, a number of stages for fabricating the device **2700** may be reduced.
(641) Those having ordinary skill in the relevant art will appreciate that in some non-limiting

examples, various other layers and/or coatings, including without limitation those forming the at least one semiconducting layer(s) **130** and/or the initial conductive coating **830**.sub.0, may cover a part of the transmissive region **2620**, especially if such layers and/or coatings are substantially transparent. In some non-limiting examples, the PDL(s) **440** may have a reduced thickness, including without limitation, by forming a well therein, which in some non-limiting examples is not dissimilar to the well defined for emissive region(s) **1910**, to further facilitate light transmission through the transmissive region **2620**.

(642) Those having ordinary skill in the relevant art will appreciate that (sub-) pixel(s) **340**/**264***x* arrangements other than the arrangement shown in FIGS. **27**A and **27**B may, in some non-limiting examples, be employed.

(643) Turning now to FIG. **27**C, there is shown an example cross-sectional view of a different version of the device **100**, shown as device **2710**, taken along the same line **27**B-**27**B in FIG. **27**A. In the figure, the device **2710** is shown as comprising a substrate **110**, a TFT insulating layer **280** and a first electrode **120** formed on a surface of the TFT insulating layer **280**. The substrate **110** may comprise the base substrate **112** (not shown for purposes of simplicity of illustration) and/or at least one TFT structure **200** corresponding to and for driving each sub-pixel **264***x* positioned substantially thereunder and electrically coupled to the first electrode **120** thereof. PDL(s) **440** are formed in non-emissive regions **1920** over the substrate **110**, to define emissive region(s) **1910** also corresponding to each sub-pixel **264***x*, over the first electrode **120** corresponding thereto. The PDL(s) **440** cover edges of the first electrode **120**.

(644) In some non-limiting examples, at least one semiconducting layer **130** is deposited over exposed region(s) of the first electrode **120** and, in some non-limiting examples, at least parts of the surrounding PDLs **440**.

(645) In some non-limiting examples, an NIC **810** is selectively deposited over first portions of the device **2710**, comprising the transmissive region **2620**.

(646) In some non-limiting examples, a conductive coating **830** may be deposited over the at least one semiconducting layer(s) **130**, including over the pixel region **2610** to form the sub-pixel(s) **264***x* thereof but not over the surrounding PDLs **440** in the transmissive region **2620**. In some non-limiting examples, the conductive coating **830** may be deposited using an open mask and/or mask-free deposition process. In some non-limiting examples, such deposition may be effected by exposing the entire surface of the device **2710** to a vapour flux of the conductive coating material **831**, which in some non-limiting examples may be Mg to selectively deposit the conductive coating **830** over second portions of the at least one semiconducting layer(s) **130** that are substantially devoid of the NIC **810**, in some examples, the pixel region **2610**, such that the conductive coating **830** is deposited on the at least one semiconducting layer(s) **130** to form the second electrode **140**.

(647) In some non-limiting examples, the transmissive region **2620** of the device **2710** remains substantially devoid of any materials that may substantially affect the transmission of light therethrough. In particular, as shown in the figure, the TFT structure **200** and/or the first electrode **120** are positioned, in a cross-sectional aspect below the sub-pixel **264***x* corresponding thereto and beyond the transmissive region **2620**. As a result, these components do not attenuate or impede light from being transmitted through the transmissive region **2620**. In some non-limiting examples, such arrangement allows a viewer viewing the device **2710** from a typical viewing distance to see through the device **2700**, in some non-limiting examples, when all of the (sub-) pixel(s) **340**/**264***x* are not emitting, thus creating a transparent AMOLED device **2710**.

(648) By providing a transmissive region **2620** that is free and/or substantially devoid of any conductive coating **830**, the transmittance in such region may, in some non-limiting examples, be favorably enhanced, by way of non-limiting example, by comparison to the device **2700** of FIG. **27**B.

(649) While not shown in the figure, in some non-limiting examples, the device **2710** may further comprise an NPC **1120** disposed between the conductive coating **830** and the at least one

semiconducting layer(s) **130**. In some non-limiting examples, the NPC **1120** may also be disposed between the NIC **810** and the PDL(s) **440**.
(650) In some non-limiting examples, the NIC **810** may be formed concurrently with the at least one semiconducting layer(s) **130**. By way of non-limiting example, at least one material used to form the NIC **810** may also be used to form the at least one semiconducting layer(s) **130**. In such non-limiting example, a number of stages for fabricating the device **2710** may be reduced.
(651) Those having ordinary skill in the relevant art will appreciate that in some non-limiting examples, various other layers and/or coatings, including without limitation those forming the at least one semiconducting layer(s) **130** and/or the conductive coating **830**, may cover a part of the transmissive region **2620**, especially if such layers and/or coatings are substantially transparent. In some non-limiting examples, the PDL(s) **440** may have a reduced thickness, including without limitation, by forming a well therein, which in some non-limiting examples is not dissimilar to the well defined for emissive region(s) **1910**, to further facilitate light transmission through the transmissive region **2620**.
(652) Those having ordinary skill in the relevant art will appreciate that (sub-) pixel(s) **340**/**264***x* arrangements other than the arrangement shown in FIGS. **27**A and **27**C may, in some non-limiting examples, be employed.
(653) Selective Deposition of a Conductive Coating Over Emissive Region(s)
(654) As discussed above, modulating the thickness of an electrode **120**, **140**, **1750**, **4150** in and across a lateral aspect **410** of emissive region(s) **1910** of a (sub-) pixel **340**/**264***x* may impact the microcavity effect observable. In some non-limiting examples, selective deposition of at least one conductive coating **830** through deposition of at least one selective coating **710**, such as an NIC **810** and/or an NPC **1120**, in the lateral aspects **410** of emissive region(s) **1910** corresponding to different sub-pixel(s) **264***x* in a pixel region **2610** may allow the optical microcavity effect in each emissive region **1910** to be controlled and/or modulated to optimize desirable optical microcavity effects on a sub-pixel **264***x* basis, including without limitation, an emission spectrum, a luminous intensity and/or an angular dependence of a brightness and/or a color shift of emitted light.
(655) Such effects may be controlled by modulating the thickness of the selective coating **710**, such as an NIC **810** and/or an NPC **1120**, disposed in each emissive region **1910** of the sub-pixel(s) **264***x* independently of one another. By way of non-limiting example, the thickness of an NIC **810** disposed over a blue sub-pixel **2643** may be less than the thickness of an NIC **810** disposed over a green sub-pixel **2642**, and the thickness of the NIC disposed over a green sub-pixel **2642** may be less than the thickness of an NIC **810** disposed over a red sub-pixel **2641**.
(656) In some non-limiting examples, such effects may be controlled to an even greater extent by independently modulating the thickness of not only the selective coating **710**, but also the conductive coating **830** deposited in part(s) of each emissive region **1910** of the sub-pixel(s) **264***x*.
(657) Such a mechanism is illustrated in the schematic diagrams of FIGS. **28**A-**28**D. These diagrams illustrate various stages of manufacturing an example version, shown generally at **2800**, of the device **100**.
(658) FIG. **28**A shows a stage **2810** of manufacturing the device **2800**. In the stage **2810**, a substrate **110** is provided. The substrate **110** comprises a first emissive region **1910***a* and a second emissive region **1910***b*. In some non-limiting examples, the first emissive region **1910***a* and/or the second emissive region **1910***b* may be surrounded and/or spaced-apart by at least one non-emissive region **1920***a*-**1920***c*. In some non-limiting examples, the first emissive region **1910***a* and/or the second emissive region **1910***b* may each correspond to a (sub-) pixel **340**/**264***x*.
(659) FIG. **28**B shows a stage **2820** of manufacturing the device **2800**. In the stage **2820**, an initial conductive coating **830**.sub.0 is deposited on an exposed layer surface **111** of an underlying material, in this case the substrate **110**. The initial conductive coating **830**.sub.0 is deposited across the first emissive region **1910***a* and the second emissive region **1910***b*. In some non-limiting examples, the initial conductive coating **830**.sub.0 is deposited across at least one of the non-

emissive regions **1920***a*-**1920***c*.
(660) In some non-limiting examples, the initial conductive coating **830**.sub.0 may be deposited using an open mask and/or a mask-free deposition process.
(661) FIG. **28**C shows a stage **2830** of manufacturing the device **2800**. In the stage **2830**, an NIC **810** is selectively deposited over a first portion of the initial conductive coating **830**.sub.0. As shown in the figure, in some non-limiting examples, the NIC **810** is deposited across the first emissive region **1910***a*, while in some non-limiting examples, the second emissive region **1910***b* and/or in some non-limiting examples, at least one of the non-emissive regions **1920***a*-**1920***c* are substantially devoid of the NIC **810**.
(662) FIG. **28**D shows a stage **2840** of manufacturing the device **2800**. In the stage **2840**, a first conductive coating **830***a* may be deposited across those second portions of the device **2800** that are substantially devoid of the NIC **810**. In some non-limiting examples, the first conductive coating **830***a* may be deposited across the second emissive region **1910***b* and/or, in some non-limiting examples, at least one of the non-emissive region **1920***a*-**1920***c*.
(663) Those having ordinary skill in the relevant art will appreciate that the evaporative process shown in FIG. **28**D and described in detail in connection with any one or more of FIGS. **7**-**8**, **11**A-**11**B and/or **12**A-**12**C may, although not shown, for simplicity of illustration, equally be deposited in any one or more of the preceding stages described in FIGS. **28**A-**28**C.
(664) Those having ordinary skill in the relevant art will appreciate that the manufacture of the device **2800** may in some non-limiting examples, encompass additional stages that are not shown for simplicity of illustration. Such additional stages may include, without limitation, depositing one or more NICs **810**, depositing one or more NPCs **1120**, depositing one or more additional conductive coatings **830**, depositing an outcoupling coating and/or encapsulation of the device **2800**.
(665) Those having ordinary skill in the relevant art will appreciate that while the manufacture of the device **2800** has been described and illustrated in connection with a first emissive region **1910***a* and a second emissive region **1910***b*, in some non-limiting examples, the principles derived therefrom may equally be deposited on the manufacture of devices having more than two emissive regions **1910**.
(666) In some non-limiting examples, such principles may be deposited on deposit conductive coating(s) of varying thickness for emissive region(s) **1910** corresponding to sub-pixel(s) **264***x*, in some non-limiting examples, in an OLED display device **100**, having different emission spectra. In some non-limiting examples, the first emissive region **1910***a* may correspond to a sub-pixel **264***x* configured to emit light of a first wavelength and/or emission spectrum and/or in some non-limiting examples, the second emissive region **1910***b* may correspond to a sub-pixel **264***x* configured to emit light of a second wavelength and/or emission spectrum. In some non-limiting examples, the device **2800** may comprise a third emissive region **1910***c* (FIG. **29**A) that may correspond to a sub-pixel **264***x* configured to emit light of a third wavelength and/or emission spectrum.
(667) In some non-limiting examples, the first wavelength may be less than, greater than, and/or equal to at least one of the second wavelength and/or the third wavelength. In some non-limiting examples, the second wavelength may be less than, greater than, and/or equal to at least one of the first wavelength and/or the third wavelength. In some non-limiting examples, the third wavelength may be less than, greater than and/or equal to at least one of the first wavelength and/or the second wavelength.
(668) In some non-limiting examples, the device **2800** may also comprise at least one additional emissive region **1910** (not shown) that may in some non-limiting examples be configured to emit light having a wavelength and/or emission spectrum that is substantially identical to at least one of the first emissive region **1910***a*, the second emissive region **1910***b* and/or the third emissive region **1910***c*.

(669) In some non-limiting examples, the NIC **810** may be selectively deposited using a shadow mask that may also have been used to deposit the at least one semiconducting layer **130** of the first emissive region **1910***a*. In some non-limiting examples, such shared use of a shadow mask may allow the optical microcavity effect(s) to be tuned for each sub-pixel **264***x* in a cost-effective manner.
(670) The use of such mechanism to create an example version **2900** of the device **100** having sub-pixel(s) **264***x* of a given pixel **340** with modulated micro-cavity effects is described in FIGS. **29**A-**29**D.
(671) In FIG. **29**A, a stage **2810** of manufacture of the device **2900** is shown as comprising a substrate **110**, a TFT insulating layer **280** and a plurality of first electrodes **120***a*-**120***c*, formed on a surface of the TFT insulating layer **280**.
(672) The substrate **110** may comprise the base substrate **112** (not shown for purposes of simplicity of illustration) and/or at least one TFT structure **200***a*-**200***c* corresponding to and for driving an emissive region **1910***a*-**1910***c* each having a corresponding sub-pixel **264***x*, positioned substantially thereunder and electrically coupled to its associated first electrode **120***a*-**120***c*. PDL(s) **440***a*-**440***d* are formed over the substrate **110**, to define emissive region(s) **1910***a*-**1910***c*. The PDL(s) **440***a*-**440***d* cover edges of their respective first electrodes **120***a*-**120***c*.
(673) In some non-limiting examples, at least one semiconducting layer **130***a*-**130***c* is deposited over exposed region(s) of their respective first electrodes **120***a*-**120***c* and, in some non-limiting examples, at least parts of the surrounding PDLs **440***a*-**440***d*.
(674) In some non-limiting examples, an initial conductive coating **830**.sub.0 may be deposited over the at least one semiconducting layer(s) **130***a*-**130***c*. In some non-limiting examples, the initial conductive coating **830**.sub.0 may be deposited using an open mask and/or mask-free deposition process. In some non-limiting examples, such deposition may be effected by exposing the entire exposed layer surface **111** of the device **2900** to a vapor flux of the initial conductive coating **830**.sub.0, which in some non-limiting examples may be Mg, to deposit the initial conductive coating **830**.sub.0 over the at least one semiconducting layer(s) **130***a*-**130***c* to form a first layer of the second electrode **140***a* (not shown), which in some non-limiting examples may be a common electrode, at least for the first emissive region **1910***a*. Such common electrode has a first thickness t.sub.c1 in the first emissive region **1910***a*. The first thickness t.sub.c1 may correspond to a thickness of the initial conductive coating **830**.sub.0.
(675) In some non-limiting examples, a first NIC **810***a* is selectively deposited over first portions of the device **2810**, comprising the first emissive region **1910***a*.
(676) In some non-limiting examples, a first conductive coating **830***a* may be deposited over the device **2900**. In some non-limiting examples, the first conductive coating **830***a* may be deposited using an open mask and/or mask-free deposition process. In some non-limiting examples, such deposition may be effected by exposing the entire exposed layer surface **111** of the device **2810** to a vapour flux of the first conductive coating **830***a*, which in some non-limiting examples may be Mg, to deposit the first conductive coating **830***a* over the initial conductive coating **830**.sub.0 that is substantially devoid of the first NIC **810***a*, in some examples, the second and third emissive region **1910***b*, **1910***c* and/or at least part(s) of the non-emissive region(s) **1920** in which the PDLs **440***a*-**440***d* lie, such that the first conductive coating **830***a* is deposited on the second portion(s) of the initial conductive coating **830**.sub.0 that are substantially devoid of the first NIC **810***a* to form a second layer of the second electrode **140***b* (not shown), which in some non-limiting examples, may be a common electrode, at least for the second emissive region **1910***b*. Such common electrode has a second thickness t.sub.c2 in the second emissive region **1910***b*. The second thickness t.sub.c2 may correspond to a combined thickness of the initial conductive coating **830**.sub.0 and of the first conductive coating **830***a* and may in some non-limiting examples be greater than the first thickness t.sub.c1.
(677) In FIG. **29**B, a stage **2920** of manufacture of the device **2900** is shown.

(678) In some non-limiting examples, a second NIC **810***b* is selectively deposited over further first portions of the device **2900**, comprising the second emissive region **1910***b*.
(679) In some non-limiting examples, a second conductive coating **830***b* may be deposited over the device **2900**. In some non-limiting examples, the second conductive coating **830***b* may be deposited using an open mask and/or mask-free deposition process. In some non-limiting examples, such deposition may be effected by exposing the entire exposed layer surface **111** of the device **2900** to a vapour flux of the second conductive coating **830***b*, which in some non-limiting examples may be Mg, to deposit the second conductive coating **830***b* over the first conductive coating **830***a* that is substantially devoid of either the first NIC **810***a* or the second NIC **810***b*, in some examples, the third emissive region **1910***c* and/or at least part(s) of the non-emissive region **1920** in which the PDLs **440***a*-**440***d* lie, such that the second conductive coating **830***b* is deposited on the further second portion(s) of the first conductive coating **830***a* that are substantially devoid of the second NIC **810***b* to form a third layer of the second electrode **140***c* (not shown), which in some non-limiting examples, may be a common electrode, at least for the third emissive region **1910***c*. Such common electrode has a third thickness t.sub.c3 in the third emissive region **1910***c*. The third thickness t.sub.c3 may correspond to a combined thickness of the initial conductive coating **830**.sub.0, the first conductive coating **830***a* and the second conductive coating **830***b* and may in some non-limiting examples be greater than either or both of the first thickness t.sub.c1 and the second thickness t.sub.c2.
(680) In FIG. **29**C, a stage **2930** of manufacture of the device **2900** is shown.
(681) In some non-limiting examples, a third NIC **810***c* is selectively deposited over additional first portions of the device **2900**, comprising the third emissive region **1910***b*.
(682) In FIG. **29**D, a stage **2940** of manufacture of the device **2900** is shown.
(683) In some non-limiting examples, at least one auxiliary electrode **1750** is disposed in the non-emissive region(s) **1920** of the device **2900** between neighbouring emissive region **1910***a*-**1910***c* thereof and in some non-limiting examples, over the PDLs **440***a*-**440***d*. In some non-limiting examples, the conductive coating **830** used to deposit the at least one auxiliary electrode **1750** may be deposited using an open mask and/or mask-free deposition process. In some non-limiting examples, such deposition may be effected by exposing the entire exposed layer surface **111** of the device **2900** to a vapour flux of the conductive coating material **831**, which in some non-limiting examples may be Mg, to deposit the conductive coating **830** over the exposed parts of the initial conductive coating **830**.sub.0, the first conductive coating **830***a* and the second conductive coating **830***b* that is substantially devoid of any of the first NIC **810***a* the second NIC **810***b* and/or the third NIC **810***c*, such that the conductive coating **830** is deposited on an additional second portion comprising the exposed part(s) of the initial conductive coating **830**.sub.0, the first conductive coating **830***a* and/or the second conductive coating **830***b* that are substantially devoid of any of the first NIC **810***a*, the second NIC **810***b* and/or the third NIC **810***c* to form the at least one auxiliary electrode **1750**. Each of the at least one auxiliary electrode **1750** is electrically coupled to a respective one of the second electrodes **140***a*-**140***c*. In some non-limiting examples, each of the at least one auxiliary electrode **1750** is in physical contact with such second electrode **140***a*-**140***c*.
(684) In some non-limiting examples, the first emissive region **1910***a*, the second emissive region **1910***b* and the third emissive region **1910***c* may be substantially devoid of the material used to form the at least one auxiliary electrode **1750**.
(685) In some non-limiting examples, at least one of the initial conductive coating **830**.sub.0, the first conductive coating **830***a* and/or the second conductive coating **830***b* may be transmissive and/or substantially transparent in at least a part of the visible wavelength range of the electromagnetic spectrum. Thus, if the first conductive coating **830***a* and/or the second conductive coating **830***b* (and/or any additional conductive coating(s) **830**) is disposed on top of the initial conductive coating **830**.sub.0 to form a multi-coating electrode **120**, **140**, **1750** that may also be transmissive and/or substantially transparent in at least a part of the visible wavelength range of the

electromagnetic spectrum. In some non-limiting examples, the transmittance of any one or more of the initial conductive coating **830**.sub.0, the first conductive coating **830***a*, the second conductive coating **830***b*, any additional conductive coating(s) **830**, and/or the multi-coating electrode **120**, **140**, **1750** may be greater than about 30%, greater than about 40% greater than about 45%, greater than about 50%, greater than about 60%, greater than about 70%, greater than about 75%, and/or greater than about 80% in at least a part of the visible wavelength range of the electromagnetic spectrum.
(686) In some non-limiting examples, a thickness of the initial conductive coating **830**.sub.0, the first conductive coating **830***a* and/or the second conductive coating **830***b* may be made relatively thin to maintain a relatively high transmittance. In some non-limiting examples, the thickness of the initial conductive coating **830**.sub.0 may be about 5 to 30 nm, about 8 to 25 nm, and/or about 10 to 20 nm. In some non-limiting examples, the thickness of the first conductive coating **830***a* may be about 1 to 25 nm, about 1 to 20 nm, about 1 to 15 nm, about 1 to 10 nm, and/or about 3 to 6 nm. In some non-limiting examples, the thickness of the second conductive coating **830***b* may be about 1 to 25 nm, about 1 to 20 nm, about 1 to 15 nm, about 1 to 10 nm, and/or about 3 to 6 nm. In some non-limiting examples, the thickness of a multi-coating electrode formed by a combination of the initial conductive coating **830**.sub.0, the first conductive coating **830***a*, the second conductive coating **830***b* and/or any additional conductive coating(s) **830** may be about 6 to 35 nm, about 10 to 30 nm, about 10 to 25 nm and/or about 12 to 18 nm.
(687) In some non-limiting examples, a thickness of the at least one auxiliary electrode **1750** may be greater than the thickness of the initial conductive coating **830**.sub.0, the first conductive coating **830***a*, the second conductive coating **830***b* and/or a common electrode. In some non-limiting examples, the thickness of the at least one auxiliary electrode **1750** may be greater than about 50 nm, greater than about 80 nm, greater than about 100 nm, greater than about 150 nm, greater than about 200 nm, greater than about 300 nm, greater than about 400 nm, greater than about 500 nm, greater than about 700 nm, greater than about 800 nm, greater than about 1 μm, greater than about 1.2 μm, greater than about 1.5 μm, greater than about 2 μm, greater than about 2.5 μm, and/or greater than about 3 μm.
(688) In some non-limiting examples, the at least one auxiliary electrode **1750** may be substantially non-transparent and/or opaque. However, since the at least one auxiliary electrode **1750** may be in some non-limiting examples provided in a non-emissive region **1920** of the device **2900**, the at least one auxiliary electrode **1750** may not cause or contribute to significant optical interference. In some non-limiting examples, the transmittance of the at least one auxiliary electrode **1750** may be less than about 50%, less than about 70%, less than about 80%, less than about 85%, less than about 90%, and/or less than about 95% in at least a part of the visible wavelength range of the electromagnetic spectrum.
(689) In some non-limiting examples, the at least one auxiliary electrode **1750** may absorb light in at least a part of the visible wavelength range of the electromagnetic spectrum.
(690) In some non-limiting examples, a thickness of the first NIC **810***a*, the second NIC **810***b*, and/or the third NIC **810***c* disposed in the first emissive region **1910***a*, the second emissive region **1910***b* and/or the third emissive region **1910***c* respectively, may be varied according to a colour and/or emission spectrum of light emitted by each emissive region **1910***a*-**1910***c*. As shown in FIGS. **29**C-**29**D, the first NIC **810***a* may have a first NIC thickness t.sub.n1, the second NIC **810***b* may have a second NIC thickness t.sub.n2 and/or the third NIC **810***c* may have a third NIC thickness t.sub.n3. In some non-limiting examples, the first NIC thickness t.sub.n1, the second NIC thickness t.sub.n2 and/or the third NIC thickness t.sub.n3 may be substantially the same as one another. In some non-limiting examples, the first NIC thickness t.sub.n1, the second NIC thickness t.sub.n2 and/or the third NIC thickness t.sub.n3 may be different from one another.
(691) In some non-limiting examples, the device **2900** may also comprise any number of emissive regions **1910***a*-**1910***c* and/or (sub-) pixel(s) **340**/**264***x* thereof. In some non-limiting examples, a

device may comprise a plurality of pixels **340**, wherein each pixel **340** comprises two, three or more sub-pixel(s) **264***x*.

(692) Those having ordinary skill in the relevant art will appreciate that the specific arrangement of (sub-) pixel(s) **340**/**264***x* may be varied depending on the device design. In some non-limiting examples, the sub-pixel(s) **264***x* may be arranged according to known arrangement schemes, including without limitation, RGB side-by-side, diamond and/or PenTile®.

(693) Conductive Coating for Electrically Coupling an Electrode to an Auxiliary Electrode

(694) Turning to FIG. **30**, there is shown a cross-sectional view of an example version **3000** of the device **100**. The device **3000** comprises in a lateral aspect, an emissive region **1910** and an adjacent non-emissive region **1920**.

(695) In some non-limiting examples, the emissive region **1910** corresponds to a sub-pixel **264***x* of the device **3000**. The emissive region **1910** has a substrate **110**, a first electrode **120**, a second electrode **140** and at least one semiconducting layer **130** arranged therebetween.

(696) The first electrode **120** is disposed on an exposed layer surface **111** of the substrate **110**. The substrate **110** comprises a TFT structure **200**, that is electrically coupled to the first electrode **120**. The edges and/or perimeter of the first electrode **120** is generally covered by at least one PDL **440**.

(697) The non-emissive region **1920** has an auxiliary electrode **1750** and a first part of the non-emissive region **1920** has a projecting structure **3060** arranged to project over and overlap a lateral aspect of the auxiliary electrode **1750**. The projecting structure **3060** extends laterally to provide a sheltered region **3065**. By way of non-limiting example, the projecting structure **3060** may be recessed at and/or near the auxiliary electrode **1750** on at least one side to provide the sheltered region **3065**. As shown, the sheltered region **3065** may in some non-limiting examples, correspond to a region on a surface of the PDL **440** that overlaps with a lateral projection of the projecting structure **3060**. The non-emissive region **1920** further comprises a conductive coating **830** disposed in the sheltered region **3065**. The conductive coating **830** electrically couples the auxiliary electrode **1750** with the second electrode **140**.

(698) An NIC **810***a* is disposed in the emissive region **1910** over the exposed layer surface **111** of the second electrode **140**. In some non-limiting examples, an exposed layer surface **111** of the projecting structure **3060** is coated with a residual thin conductive film **3040** from deposition of a thin conductive film to form the second electrode **140**. In some non-limiting examples, a surface of the residual thin conductive film **3040** is coated with a residual NIC **810***b* from deposition of the NIC **810**.

(699) However, because of the lateral projection of the projecting structure **3060** over the sheltered region **3065**, the sheltered region **3065** is substantially devoid of NIC **810**. Thus, when a conductive coating **830** is deposited on the device **3000** after deposition of the NIC **810**, the conductive coating **830** is deposited on and/or migrates to the sheltered region **3065** to couple the auxiliary electrode **1750** to the second electrode **140**.

(700) Those having ordinary skill in the relevant art will appreciate that a non-limiting example has been shown in FIG. **30** and that various modifications may be apparent. By way of non-limiting example, the projecting structure **3060** may provide a sheltered region **3065** along at least two of its sides. In some non-limiting examples, the projecting structure **3060** may be omitted and the auxiliary electrode **1750** may include a recessed portion that defines the sheltered region **3065**. In some non-limiting examples, the auxiliary electrode **1750** and the conductive coating **830** may be disposed directly on a surface of the substrate **110**, instead of the PDL **440**.

(701) Selective Deposition of Optical Coating

(702) In some non-limiting examples, a device **100** (not shown), which in some non-limiting examples may be an opto-electronic device, comprises a substrate **110**, an NIC **810** and an optical coating. The NIC **810** covers a first lateral portion of the substrate **110**. The optical coating covers a second lateral portion of the substrate. At least a part of the NIC **810** is substantially devoid of the optical coating.

(703) In some non-limiting examples, the optical coating may be used to modulate optical properties of light being transmitted, emitted and/or absorbed by the device **100**, including without limitation, plasmon modes. By way of non-limiting example, the optical coating may be used as an optical filter, index-matching coating, optical out-coupling coating, scattering layer, diffraction grating, and/or parts thereof.
(704) In some non-limiting examples, the optical coating may be used to modulate at least one optical microcavity effect in the device **100** by, without limitation, tuning the total optical path length and/or the refractive index thereof. At least one optical property of the device **100** may be affected by modulating at least one optical microcavity effect including without limitation, the output light, including without limitation, an angular dependence of a brightness and/or a color shift thereof. In some non-limiting examples, the optical coating may be a non-electrical component, that is, the optical coating may not be configured to conduct and/or transmit electrical current during normal device operations.
(705) In some non-limiting examples, the optical coating may be formed of any material used as a conductive coating **830** and/or employing any mechanism of depositing a conductive coating **830** as described herein.
(706) Edge Effects of NICs and Conductive Coatings
(707) FIGS. **31**A-**31**I describe various potential behaviours of NICs **810** at a deposition interface with conductive coatings **830**.
(708) Turning to FIG. **31**A, there is shown a first example of a part of an example version **3100** of the device **100** at an NIC deposition boundary. The device **3100** comprises a substrate **110** having a layer surface **111**. An NIC **810** is deposited over a first portion **3110** of the layer surface **111**. A conductive coating **830** is deposited over a second portion **3120** of the layer surface **111**. As shown, by way of non-limiting example, the first portion **3110** and the second portion **3120** are distinct and non-overlapping portions of the layer surface **111**.
(709) The conductive coating **830** comprises a first part **830**.sub.1 and a remaining part **830**.sub.2. As shown, by way of non-limiting example, the first part **830**.sub.1 of the conductive coating **830** substantially covers the second portion **3120** and the second part **830**.sub.2 of the conductive coating **830** partially projects over and/or overlaps a first part of the NIC **810**.
(710) In some non-limiting examples, since the NIC **810** is formed such that its surface **3111** exhibits a relatively low affinity or initial sticking probability S.sub.0 for a material used to form the conductive coating **830**, there is a gap **3129** formed between the projecting and/or overlapping second part **830**.sub.2 of the conductive coating **830** and the surface **3111** of the NIC **810**. As a result, the second part **830**.sub.2 is not in physical contact with the NIC **810** but is spaced-apart therefrom by the gap **3129** in a cross-sectional aspect. In some non-limiting examples, the first part **830**.sub.1 of the conductive coating **830** may be in physical contact with the NIC **810** at an interface and/or boundary between the first portion **3110** and the second portion **3120**.
(711) In some non-limiting examples, the projecting and/or overlapping second part **830**.sub.2 of the conductive coating **830** may extend laterally over the NIC **810** by a comparable extent as a thickness t.sub.1 of the conductive coating **830**. By way of non-limiting example, as shown, a width w.sub.2 of the second part **830**.sub.2 may be comparable to the thickness t.sub.1. In some non-limiting examples, a ratio of w.sub.2:t.sub.1 may be in a range of about 1:1 to about 1:3, about 1:1 to about 1:1.5, and/or about 1:1 to about 1:2. While the thickness t.sub.1 may in some non-limiting examples be relatively uniform across the conductive coating **830**, in some non-limiting examples, the extent to which the second part **830**.sub.2 projects and/or overlaps with the NIC **810** (namely w.sub.2) may vary to some extent across different parts of the layer surface **111**.
(712) Turning now to FIG. **31**B, the conductive coating **830** is shown to include a third part **830**.sub.3 disposed between the second part **830**.sub.2 and the NIC **810**. As shown, the second part **830**.sub.2 of the conductive coating **830** extends laterally over and is spaced apart from the third part **830**.sub.3 of the conductive coating **830** and the third part **830**.sub.3 may be in physical

contact with the surface **3111** of the NIC **810**. A thickness t.sub.3 of the third part **830**.sub.3 of the conductive coating **830** may be less and in some non-limiting examples, substantially less than the thickness t.sub.1 of the first part **830**.sub.1 thereof. In some non-limiting examples, a width w.sub.3 of the third part **830**.sub.3 may be greater than the width w.sub.2 of the second part **830**.sub.2. In some non-limiting examples, the third part **830**.sub.3 may extend laterally to overlap the NIC **810** to a greater extent than the second part **830**.sub.2. In some non-limiting examples, a ratio of w.sub.3:t.sub.1 may be in a range of about 1:2 to about 3:1 and/or about 1:1.2 to about 2.5:1. While the thickness t.sub.1 may in some non-limiting examples be relatively uniform across the conductive coating **830**, in some non-limiting examples, the extent to which the third part **830**.sub.3 projects and/or overlaps with the NIC **810** (namely w.sub.3) may vary to some extent across different parts of the layer surface **111**.

(713) The thickness t.sub.3 of the third part **830**.sub.3 may be no greater than and/or less than about 5% of the thickness t.sub.1 of the first part **830**.sub.1. By way of non-limiting example, t.sub.3 may be no greater than and/or less than about 4%, no greater than and/or less than about 3%, no greater than and/or less than about 2%, no greater than and/or less than about 1%, and/or no greater than and/or less than about 0.5% of t.sub.1. Instead of, and/or in addition to, the third part **830**.sub.3 being formed as a thin film, as shown, the material of the conductive coating **830** may form as islands and/or disconnected clusters on a part of the NIC **810**. By way of non-limiting example, such islands and/or disconnected clusters may comprise features that are physically separated from one another, such that the islands and/or clusters do not form a continuous layer.

(714) Turning now to FIG. **31**C, an NPC **1120** is disposed between the substrate **110** and the conductive coating **830**. The NPC **1120** is disposed between the first part **830**.sub.1 of the conductive coating **830** and the second portion **3120** of the substrate **110**. The NPC **1120** is illustrated as being disposed on the second portion **3120** and not on the first portion **3110**, where the NIC **810** has been deposited. The NPC **1120** may be formed such that, at an interface and/or boundary between the NPC **1120** and the conductive coating **830**, a surface of the NPC **1120** exhibits a relatively high affinity or initial sticking probability S.sub.0 for the material of the conductive coating **830**. As such, the presence of the NPC **1120** may promote the formation and/or growth of the conductive coating **830** during deposition.

(715) Turning now to FIG. **31**D, the NPC **1120** is disposed on both the first portion **3110** and the second portion **3120** of the substrate **110** and the NIC **810** covers a part of the NPC **1120** disposed on the first portion **3110**. Another part of the NPC **1120** is substantially devoid of the NIC **810** and the conductive coating **830** covers such part of the NPC **1120**.

(716) Turning now to FIG. **31**E, the conductive coating **830** is shown to partially overlap a part of the NIC **810** in a third portion **3130** of the substrate **110**. In some non-limiting examples, in addition to the first part **830**.sub.1 and the second part **830**.sub.2, the conductive coating **830** further includes a fourth part **830**.sub.4. As shown, the fourth part **830**.sub.4 of the conductive coating **830** is disposed between the first part **830**.sub.1 and the second part **830**.sub.2 of the conductive coating **830** and the fourth part **830**.sub.4 may be in physical contact with the layer surface **3111** of the NIC **810**. In some non-limiting examples, the overlap in the third portion **3130** may be formed as a result of lateral growth of the conductive coating **830** during an open mask and/or mask-free deposition process. In some non-limiting examples, while the layer surface **3111** of the NIC **810** may exhibit a relatively low initial sticking probability S.sub.0 for the material of the conductive coating **830**, and thus the probability of the material nucleating the layer surface **3111** is low, as the conductive coating **830** grows in thickness, the conductive coating **830** may also grow laterally and may cover a subset of the NIC **810** as shown.

(717) Turning now to FIG. **31**F the first portion **3110** of the substrate **110** is coated with the NIC **810** and the second portion **3120** adjacent thereto is coated with the conductive coating **830**. In some non-limiting examples, it has been observed that conducting an open mask and/or mask-free deposition of the conductive coating **830** may result in the conductive coating **830** exhibiting a

tapered cross-sectional profile at and/or near an interface between the conductive coating **830** and the NIC **810**.
(718) In some non-limiting examples, a thickness of the conductive coating **830** at and/or near the interface may be less than an average thickness of the conductive coating **830**. While such tapered profile is shown as being curved and/or arched, in some non-limiting examples, the profile may, in some non-limiting examples be substantially linear and/or non-linear. By way of non-limiting example, the thickness of the conductive coating **830** may decrease, without limitation, in a substantially linear, exponential and/or quadratic fashion in a region proximal to the interface.
(719) It has been observed that a contact angle θ.sub.c of the conductive coating **830** at and/or near the interface between the conductive coating **830** and the NIC **810** may vary, depending on properties of the NIC **810**, such as a relative affinity and/or an initial sticking probability S.sub.0. It is further postulated that the contact angle θ.sub.c of the nuclei may in some non-limiting examples, dictate the thin film contact angle of the conductive coating **830** formed by deposition. Referring to FIG. **31**F by way of non-limiting example, the contact angle θ.sub.c may be determined by measuring a slope of a tangent of the conductive coating **830** at or near the interface between the conductive coating **830** and the NIC **810**. In some non-limiting examples, where the cross-sectional taper profile of the conductive coating **830** is substantially linear, the contact angle θ.sub.c may be determined by measuring the slope of the conductive coating **830** at and/or near the interface. As will be appreciated by those having ordinary skill in the relevant art, the contact angle θ.sub.c may be generally measured relative to an angle of the underlying surface. In the present disclosure, for purposes of simplicity of illustration, the coatings **810**, **830** are shown deposited on a planar surface. However, those having ordinary skill in the relevant art will appreciate that such coatings **810**, **830** may be deposited on non-planar surfaces.
(720) In some non-limiting examples, the contact angle θ.sub.c of the conductive coating **830** may be greater than about 90°. Referring now to FIG. **31**G, by way of non-limiting example, the conductive coating **830** is shown as including a part extending past the interface between the NIC **810** and the conductive coating **830** and is spaced apart from the NIC by a gap **3129**. In such non-limiting scenario, the contact angle θ.sub.c may, in some non-limiting examples, be greater than about 90°.
(721) In some non-limiting examples, it may be advantageous to form a conductive coating **830** exhibiting a relatively high contact angle θ.sub.c. By way of non-limiting example, the contact angle θ.sub.c may be greater than about 10°, greater than about 15°, greater than about 20°, greater than about 25°, greater than about 30°, greater than about 35°, greater than about 40°, greater than about 50°, greater than about 70°, greater than about 70°, greater than about 75°, and/or greater than about 80°. By way of non-limiting example, a conductive coating **830** having a relatively high contact angle θ.sub.c may allow for creation of finely patterned features while maintaining a relatively high aspect ratio. By way of non-limiting example, it may be desirable to form a conductive coating **830** exhibiting a contact angle θ.sub.c greater than about 90°. By way of non-limiting example, the contact angle θ.sub.c may be greater than about 90°, greater than about 95°, greater than about 100°, greater than about 105°, greater than about 110° greater than about 120°, greater than about 130°, greater than about 135°, greater than about 140°, greater than about 145°, greater than about 150° and/or greater than about 170°.
(722) Turning now to FIGS. **31**H-**31**I, the conductive coating **830** partially overlaps a part of the NIC **810** in the third portion **3130** of the substrate **100**, which is disposed between the first portion **3110** and the second portion **3120** thereof. As shown, the subset of the conductive coating **830** partially overlapping a subset of the NIC **810** may be in physical contact with the surface **3111** thereof. In some non-limiting examples, the overlap in the third region **3130** may be formed as a result of lateral growth of the conductive coating **830** during an open mask and/or mask-free deposition process. In some non-limiting examples, while the surface **3111** of the NIC **810** may exhibit a relatively low affinity or initial sticking probability S.sub.0 for the material of the

conductive coating **830** and thus the probability of the material nucleating on the layer surface **3111** is low, as the conductive coating **830** grows in thickness, the conductive coating **830** may also grow laterally and may cover a subset of the NIC **810**.
(723) In the case of FIGS. **31**H-**31**I, the contact angle θ.sub.c of the conductive coating **830** may be measured at an edge thereof near the interface between it and the NIC **810**, as shown. In FIG. **31**I, the contact angle θ.sub.c may be greater than about 90°, which may in some non-limiting examples result in a subset of the conductive coating **830** being spaced apart from the NIC **810** by a gap **3129**.
(724) Capping Layer Tuned to Individual Emissive Region
(725) In some non-limiting examples, an opto-electronic device **100** may comprise a CPL **3610** to promote outcoupling of light emitted by the device **100**, which may thus enhance an EQE thereof, including without limitation, by enhancing emissions and/or adjust the angular spectral distributions. Typically, such a CPL **3610** comprises a layer that extends across substantially all of the lateral aspect of the device **100**, including without limitation, across all emissive regions **1910** therein.
(726) Since, in some non-limiting examples, such CPLs **3610** are typically formed of a common CPL material and in some non-limiting examples, have a substantially common thickness, the use of such CPLs **3610** to tune the optical characteristics of an individual emissive region **1910** and to a emission wavelength spectrum associated therewith may be substantially limited.
(727) It will be understood by those having ordinary skill in the relevant art that such CPL **3610** may be (at least) one of the plurality of layers of the device **100**. Those having ordinary skill in the relevant art will appreciate that the CPL **3610** and the CPL material of which it is comprised, especially when disposed as a film and under conditions and/or by mechanisms substantially similar to those employed in depositing the CPL **3610**, may exhibit largely similar optical and/or other properties.
(728) For purposes of simplicity of description, in the present disclosure, the CPL **3610** and the CPL material of which it is comprised, may be referred to collectively as a CPL(m), and such term may have appended thereto, a character denoting a specific instance thereof.
(729) Turning now to FIG. **36**A, which roughly corresponds to FIG. **28**C, there is shown a stage **3630** of manufacturing an example version **3600** of the device **2800**.
(730) In some non-limiting examples, the device **3600** comprises a plurality of emissive regions **1910**, comprising a first emissive region **1910***a* and a second emissive region **1910***b*, each configured to emit light having a respective emission spectrum in a corresponding wavelength range, which may be characterized by an associated onset wavelength λ.sub.onset and/or an associated peak wavelength λ.sub.max.
(731) In some non-limiting examples, an emission spectrum that lies in the R(ed) portion of the visible light spectrum may be characterized by a peak wavelength λ.sub.max that may lie in a wavelength range of 600 nm to about 640 nm and in some non-limiting examples, may be substantially about 620 nm.
(732) In some non-limiting examples, an emission spectrum that lies in the G(reen) portion of the visible light spectrum may be characterized by a peak wavelength λ.sub.max that may lie in a wavelength range of 510 nm to about 540 nm and in some non-limiting examples, may be substantially about 530 nm.
(733) In some non-limiting examples, an emission spectrum that lies in the B(lue) portion of the visible light spectrum may be characterized by a peak wavelength λ.sub.max that may lie in a wavelength range of 450 nm to about 460 nm and in some non-limiting examples, may be substantially about 455 nm.
(734) Those having ordinary skill in the relevant art will appreciate that in some non-limiting examples, the first emissive region **1910***a* and/or the second emissive region **1910***b* may correspond to any one of a R(ed) sub-pixel **2641** that emits photons having an emission spectrum

that lies in the R(ed) portion of the visible light spectrum, a G(reen) sub-pixel **2642** that emits photons having an emission spectrum that lies in the G(reen) portion of the visible light spectrum, or a B(lue) sub-pixel **2643** that emits photons having an emission spectrum that lies in the B(lue) portion of the visible light spectrum.

(735) In the stage **3630**, a first CPL **3610***a* is selectively deposited over a first portion of the exposed layer surface **111** of an underlying material. In some non-limiting examples, the underlying material may be an initial conductive coating **830**.sub.0. As shown in the figure, in some non-limiting examples, a CPL material for depositing the first CPL **3610***a* is deposited across the first emissive region **1910***a*, while in some non-limiting examples, the second emissive region **1910***b* and/or in some non-limiting examples, at least one of the non-emissive regions **1920***a*-**1920***c* are substantially devoid of the first CPL **3610***a*. In some non-limiting examples, the first CPL **3610***a* may be deposited over at least one of the non-emissive regions **1920***a*-**1920***c*.

(736) In some non-limiting examples, the first CPL **3610***a* has optical characteristics tuned to the first emission spectrum. In some non-limiting examples, a thickness, a morphology, and/or a material composition, of the first CPL **3610***a* are tuned to provide a high refractive index across at least a portion of the first emission spectrum, including without limitation, at least one of the first onset wavelength λ.sub.onset a and/or the first peak wavelength λ.sub.max a.

(737) In some non-limiting examples, the first CPL **3610***a* has a refractive index that is greater than or equal to about 1.9, greater than or equal to about 1.95, greater than or equal to about 2.0, greater than or equal to about 2.05, greater than or equal to about 2.1, greater than or equal to about 2.2, greater than or equal to about 2.3, and/or greater than or equal to about 2.5, in at least a part of the first emission spectrum, which in some non-limiting examples, may comprise the first peak wavelength λ.sub.max a.

(738) In some non-limiting examples, there may be, at and/or proximate to the absorption edge, a generally positive correlation between refractive index and transmittance, or in other words, a generally negative correlation between refractive index and absorption at or near the absorption edge. As a result, in some non-limiting examples, the optical characteristics of the first CPL **3610***a* are tuned such that the absorption edge of the first CPL **3610***a* is slightly lower than the first onset wavelength λ.sub.onset a.

(739) In some non-limiting examples, the absorption edge of a substance may correspond to a wavelength at which the extinction coefficient k decreases and approaches a threshold value near 0. As a result, in some non-limiting examples, tuning the optical characteristics of the first CPL **3610***a* with reference to the absorption edge of the first CPL **3610***a* as disclosed herein, may serve as an approximate mechanism to provide a high refractive index across at least a portion of the first emission spectrum as disclosed herein.

(740) As a result, in some non-limiting examples, the first CPL **3610***a* may have a first extinction coefficient k.sub.a that is high at a wavelength shorter than the first onset wavelength λ.sub.onset a. In some non-limiting examples, the first CPL **3610***a* may have a first extinction coefficient k.sub.a that is greater than or equal to about 0.1, greater than or equal to 0.3, greater than or equal to about 0.5, greater than or equal to about 0.75, greater than or equal to about 0.8, and/or greater than or equal to about 0.9, at a wavelength below the first onset wavelength λ.sub.onset a.

(741) In some non-limiting examples, the first CPL **3610***a* may additionally act as a patterning coating **810**, in that it exhibits a relatively low initial sticking coefficient for the conductive coating material **831** relative to the exposed layer surface **111** of the underlying material, including without limitation, the initial conductive coating **830**.sub.0, and be selectively deposited over first portions of the initial conductive coating **830**.sub.0 in the example device **2800**, comprising the first emissive region **1910***a*, to inhibit deposition of a first conductive coating **830***a* thereon.

(742) FIG. **36**B shows a stage **3640** of manufacturing the device **3600**. In the stage **3620**, a first conductive coating **830***a* may be deposited, by exposing the entire surface of the device **3600** to a vapour flux of the conductive coating material **831** to selectively deposit it as the first conductive

coating **830***a* over those second portions of the device **3600** that are substantially devoid of the first CPL **3610***a*.
(743) In some non-limiting examples, the first conductive coating **830***a* may be deposited across the second emissive region **1910***b* and/or, in some non-limiting examples, at least one of the non-emissive regions **1920***a*-**1920***c*. In some non-limiting examples, the first conductive coating **830***a* may be deposited over at least one of the non-emissive regions **1920***a*-**1920***c*.
(744) In some non-limiting examples, the first conductive coating **830***a* may be deposited using an open mask and/or a mask-free deposition process.
(745) Those having ordinary skill in the relevant art will appreciate that, in some non-limiting examples, where the first CPL **3610***a* does not act as a patterning coating **810**, a further patterning coating **810** (not shown) may be disposed where and when appropriate to allow patterning of the first conductive coating **830***a* to be deposited in desired locations, even in the absence of a FMM.
(746) In some non-limiting examples, the conductive coating material **831** used to form the first conductive coating **830***a* may comprise various materials used to form light-transmissive conductive layers and/or coatings, including without limitation, TCOs (including without limitation, ITO, FTO), non-metallic thin films, metal thin films, including without limitation Mg, Al, Yb, Ag, Zn, and/or Cd, and/or combinations thereof, including without limitation, alloys containing any of these, including without limitation, Mg:Ag, Mg:Yb, and/or combinations thereof in an alloy composition ranging from about 1:10 to about 10:1 by volume, and/or combinations thereof. The first conductive coating **830***a* may comprise a plurality of layers and/or coatings in a multi-layer coating.
(747) In some non-limiting examples, the conductive coating material **831** used to form the first conductive coating **830***a* may be the same and/or different from the conductive coating material **831** used to form the initial conductive coating **830**.sub.0, if any.
(748) Those having ordinary skill in the relevant art will appreciate that the evaporative process shown in FIG. **36**B and described in detail in connection with any one or more of FIGS. **7**-**8**, **11**A-**11**B and/or **12**A-**12**C may, although not shown, for simplicity of illustration, equally be deposited in any one or more of the preceding stages described in FIGS. **28**A-**28**B and/or **36**A.
(749) Those having ordinary skill in the relevant art will appreciate that the manufacture of the device **3600** may, in some non-limiting examples, encompass additional stages that are not shown for simplicity of illustration. Such additional stages may include, without limitation, depositing one or more patterning coatings **810**, **1120**, depositing one or more CPLs **3610**, depositing one or more additional conductive coatings **830**, depositing an outcoupling coating and/or encapsulation of the device **2800**.
(750) Those having ordinary skill in the relevant art will appreciate that, in some non-limiting examples, the plurality of emissive regions **1910** may comprise more than just the first emissive region **1910***a* and the second emissive region **1910***b* as shown in the device **3600**. In some non-limiting examples, there may be three or more emissive regions **1910**, each configured to emit light having a respective emission spectrum in a corresponding wavelength range, which may be characterized by an associated onset wavelength λ.sub.onset and/or an associated peak wavelength λ.sub.max. In some non-limiting examples, there may be three emissive regions **1910***a*, **1910***b*, **1910***c*, corresponding to (in no particular order) respective ones of a R(ed) sub-pixel **2641** that emits photons having an emission spectrum that lies in the R(ed) portion of the visible light spectrum, a G(reen) sub-pixel **2642** that emits photons having an emission spectrum that lies in the G(reen) portion of the visible light spectrum, or a B(lue) sub-pixel **2643** that emits photons having an emission spectrum that lies in the B(lue) portion of the visible light spectrum.
(751) Turning now to FIG. **37**A, there is shown a stage **3710** of manufacturing an example version **3700** of the device **3600** that roughly corresponds to FIG. **36**B, but with three emissive regions **1910***a*, **1910***b*, **1910***c*, surrounded by non-emissive regions **1920***a*, **1920***b*, **1920***c*, **1920***d*.
(752) As shown in the figure, the first conductive coating **830***a* may be deposited, by exposing the

entire surface of the device **3700** to a vapour flux of the conductive coating material **831** to selectively deposit it as the first conductive coating **830***a* over those second portions of the device **3700** that are substantially devoid of the first CPL **3610***a*. In some non-limiting examples, the first conductive coating **830***a* may be deposited across the second emissive region **1910***b* and/or the third emissive region **1910***c* and/or, in some non-limiting examples, at least one of the non-emissive region **1920***a*-**1920***d*. In some non-limiting examples, the first conductive coating **830***a* may be deposited over at least one of the non-emissive regions **1920***a*-**1920***d*.
(753) FIG. **37**B shows a stage **3720** of manufacturing the device **3700**. In the stage **3720**, a second CPL **3610***b* is selectively deposited over a first portion of the first conductive coating **830***a*. As shown in the figure, in some non-limiting examples, a CPL material for depositing the second CPL **3610***b* is deposited across the second emissive region **1910***b*, while in some non-limiting examples, the third emissive region **1910***c* and/or in some non-limiting examples, at least one of the non-emissive regions **1920***a*-**1920***d* are substantially devoid of the second CPL **3610***b*. In some non-limiting examples, the second CPL **3610***b* may be deposited over at least one of the non-emissive regions **1920***a*-**1920***d*.
(754) In some non-limiting examples, a thickness, a morphology, and/or a material composition, of the second CPL **3610***b* are tuned to provide a high refractive index across at least a portion of the second emission spectrum, including without limitation, at least one of the second onset wavelength λ.sub.onset b and/or the second peak wavelength λ.sub.max b.
(755) In some non-limiting examples, the second CPL **3610***b* has a refractive index that is greater than or equal to about 1.9, greater than or equal to about 1.95, greater than or equal to about 2.0, greater than or equal to about 2.05, greater than or equal to about 2.1, greater than or equal to about 2.2, greater than or equal to about 2.3, and/or greater than or equal to about 2.5, in at least a part of the second emission spectrum, which in some non-limiting examples, may comprise the second peak wavelength λ.sub.max b.
(756) In some non-limiting examples, the optical characteristics of the second CPL **3610***b* are tuned such that the absorption edge of the second CPL **3610***b* is slightly lower than the second onset wavelength λ.sub.onset b.
(757) In some non-limiting examples, the absorption edge of a substance may correspond to a wavelength at which the extinction coefficient k approaches a threshold value near 0. As a result, in some non-limiting examples, tuning the optical characteristics of the second CPL **3610***b* with reference to the absorption edge of the second CPL **3610***b* as disclosed herein, may serve as an approximate mechanism to provide a high refractive index across at least a portion of the second emission spectrum as disclosed herein.
(758) As a result, in some non-limiting examples, the second CPL **3610***b* may have a second extinction coefficient k.sub.b that is low at a wavelength below the second onset wavelength λ.sub.onset b. In some non-limiting examples, the second CPL **3610***b* may have a second extinction coefficient k.sub.b that is greater than or equal to about 0.1, greater than or equal to 0.3, greater than or equal to about 0.5, greater than or equal to about 0.75, greater than or equal to about 0.8, and/or greater than or equal to about 0.9, at a wavelength below the second onset wavelength λ.sub.onset b.
(759) In some non-limiting examples, the second CPL **3610***b* may additionally act as a patterning coating **810**, in that it exhibits a relatively low initial sticking coefficient for the conductive coating material **831** relative to the exposed layer surface **111** of the first conductive coating **830***a*, and be selectively deposited over first portions of the first conductive coating **830***a* in the example device **3700**, comprising the second emissive region **1910***b*, to inhibit deposition of a second conductive coating **830***b* thereon.
(760) In some non-limiting examples, the CPL material for depositing the second CPL **3610***b* may be the same and/or different from the CPL material for depositing the first CPL **3610***a*.
(761) FIG. **37**C shows a stage **3730** of manufacturing the device **3700**. In the stage **3730**, a second

conductive coating **830***b* may be deposited, by exposing the entire surface of the device **3700** to a vapour flux of the conductive coating material **831** to selectively deposit it as the second conductive coating **830***b* over those second portions of the device **3700** that are substantially devoid of at least one of the first CPL **3610***a* and the second CPL **3610***b*. In some non-limiting examples, the second conductive coating **830***b* may be deposited across the third emissive region **1910***c* and/or, in some non-limiting examples, at least one of the non-emissive regions **1920***a*-**1920***d*. In some non-limiting examples, the second conductive coating **830***b* may be deposited over at least one of the non-emissive regions **1920***a*-**1920***d*.

(762) In some non-limiting examples, the second conductive coating **830***b* may be deposited using an open mask and/or a mask-free deposition process.

(763) Those having ordinary skill in the relevant art will appreciate that, in some non-limiting examples, where the second CPL **3610***b* does not act as a patterning coating **810**, a patterning coating **810** (not shown) may be disposed where and when appropriate to allow patterning of the second conductive coating **830***b* to be deposited in desired locations, even in the absence of a FMM.

(764) In some non-limiting examples, the conductive coating material **831** used to form the second conductive coating **830***b* may be the same and/or different from the conductive coating material **831** used to form the initial conductive coating **830**.sub.0, if any, and/or may be the same and/or different from the conductive coating material **831** used to form the first conductive coating **830***a*.

(765) FIG. **37**D shows a stage **3740** of manufacturing the device **3700**. In the stage **3740**, a third CPL **3610***c* is selectively deposited over a first portion of the second conductive coating **830***b*. As shown in the figure, in some non-limiting examples, a CPL material for depositing the third CPL **3610***c* is deposited across the third emissive region **1910***c*, while in some non-limiting examples, at least one of the non-emissive regions **1920***a*-**1920***d* are substantially devoid of the second CPL **3610***b*. In some non-limiting examples, the third CPL **3610***c* may be deposited over at least one of the non-emissive regions **1920***a*-**1920***d*.

(766) In some non-limiting examples, a thickness, a morphology, and/or a material composition, of the third CPL **3610***c* are tuned to provide a high refractive index across at least a portion of the third emission spectrum, including without limitation, at least one of the third onset wavelength λ.sub.onset c and/or the third peak wavelength λ.sub.max c.

(767) In some non-limiting examples, the third CPL **3610***c* has a refractive index that is greater than or equal to about 1.9, greater than or equal to about 1.95, greater than or equal to about 2.0, greater than or equal to about 2.05, greater than or equal to about 2.1, greater than or equal to about 2.2, greater than or equal to about 2.3, and/or greater than or equal to about 2.5, in at least a part of the third emission spectrum, which in some non-limiting examples, may comprise the third peak wavelength λ.sub.max c.

(768) In some non-limiting examples, the optical characteristics of the third CPL **3610***c* are tuned such that the absorption edge of the third CPL **3610***c* is slightly lower than the third onset wavelength λ.sub.onset c.

(769) In some non-limiting examples, the absorption edge of a substance may correspond to a wavelength at which the extinction coefficient k approaches a threshold value near 0. As a result, in some non-limiting examples, tuning the optical characteristics of the third CPL **3610***c* with reference to the absorption edge of the third CPL **3610***c* as disclosed herein, may serve as an approximate mechanism to provide a high refractive index across at least a portion of the third emission spectrum as disclosed herein.

(770) As a result, in some non-limiting examples, the third CPL **3610***c* may have a third extinction coefficient k.sub.c that is low at a wavelength below the third onset wavelength λ.sub.onset c. In some non-limiting examples, the third CPL **3610***c* may have a third extinction coefficient k.sub.c that is greater than or equal to about 0.1, greater than or equal to 0.3, greater than or equal to about 0.5, greater than or equal to about 0.75, greater than or equal to about 0.8, and/or greater than or

equal to about 0.9, at a wavelength below the third onset wavelength λ.sub.onset c.
(771) In some non-limiting examples, the third CPL **3610***c* may additionally act as a patterning coating **810**, in that it exhibits a relatively low initial sticking coefficient for the conductive coating material **831** relative to the exposed layer surface **111** of the second conductive coating **830***b*, and be selectively deposited over first portions of the second conductive coating **830***b* in the example device **3700**, comprising the third emissive region **1910***c*, to inhibit deposition of a conductive coating material **831** thereon for forming an auxiliary electrode **1750**.
(772) In some non-limiting examples, the CPL material for forming the third CPL **3610***c* may be the same and/or different from: the CPL material for forming the first CPL **3610***a* and/or the CPL material for forming the second CPL **3610***b*.
(773) FIG. **37**E shows a stage **3750** of manufacturing the device **3700**. In the stage **3750**, a conductive coating material **831** may be deposited, by exposing the entire surface of the device **3700** to a vapour flux thereof to selectively deposit it as at least one auxiliary electrode **1750** over those second portions of the device **3700** that are substantially devoid of the third CPL **3610***c*. In some non-limiting examples, the at least one auxiliary electrode **1750** may be deposited across at least one of the non-emissive regions **1920***a*-**1920***d*.
(774) In some non-limiting examples, the at least one auxiliary electrode **1750** may be deposited using an open mask and/or a mask-free deposition process.
(775) Those having ordinary skill in the relevant art will appreciate that, in some non-limiting examples, where the third CPL **3610***c* does not act as a patterning coating **810**, a patterning coating **810** (not shown) may be disposed where and when appropriate to allow patterning of the at least one auxiliary electrode **1750** to be deposited in desired locations, even in the absence of a FMM.
(776) In some non-limiting examples, the conductive coating material **831** used to form the at least one auxiliary electrode **1750** may be the same and/or different from: the conductive coating material **831** used to form the initial conductive coating **830**.sub.0, if any, the conductive coating material **831** used to form the first conductive coating **830***a*, and/or the conductive coating **831** used to form the second conductive coating **830***b*.
(777) As previously discussed in connection with FIGS. **29**A-**29**D, such a mechanism may create an example version **3800** of the device **100** having sub-pixel(s) **264***x* of a given pixel **340** with modulated micro-cavity effects as described in FIGS. **38**A-**38***f*.
(778) In FIG. **38**A, a stage **3805** of manufacture of the device **3800** is shown as comprising a substrate **110**, a TFT insulating layer **280** and a plurality of first electrodes **120***a*-**120***c*, formed on a surface of the TFT insulating layer **280**.
(779) The substrate **110** may comprise the base substrate **112** (not shown for purposes of simplicity of illustration), at least one TFT structure **200***a*-**200***c* corresponding to and for driving an emissive region **1910***a*-**1910***c* each having a corresponding sub-pixel **264***x*, positioned substantially thereunder and electrically coupled to its associated first electrode **120***a*-**120***c*, PDL(s) **440***a*-**440***d* formed over the substrate **110**, to define emissive region(s) **1910***a*-**1910***c* that cover edges of their respective first electrodes **120***a*-**120***c*, and at least one semiconducting layer **130***a*-**130***c* deposited over exposed region(s) of their respective first electrodes **120***a*-**120***c* and, in some non-limiting examples, at least parts of the surrounding PDLs **440***a*-**440***d*.
(780) In the example stage **3805** of FIG. **38**A, the emissive regions **1910***a*, **1910***b*, **1910***c* may comprise separate structures that are not electrically coupled together. This may be achieved by depositing at least one PDL patterning coating, which in some non-limiting examples, may comprise a PDL CPL **3810***a*, **3810***b*, **3810***c*, **3810***d* acting as a patterning coating **810** across at least a part of the lateral aspect **420** of the non-emissive regions **1920***a*, **1920***b*, **1920***c*, **1920***c*, including without limitation, in some non-limiting examples, an elevated portion of the corresponding PDLs **440***a*, **440***b*, **440***c*, **440***d*.
(781) In some non-limiting examples, a CPL material for depositing the at least one PDL CPL **3810***a*, **3810***b*, **3810***c*, and/or **3810***d* may be the same and/or different from: the CPL material for

depositing the first CPL **3610***a*, the CPL material for depositing the second CPL **3610***b*, and/or the CPL material for depositing the third CPL **3610***c*.
(782) An alternate stage **3810** of the device **3800** is shown in FIG. **38**B. In the stage **3810**, the step of depositing a patterning coating **810**, which may, in some non-limiting examples, comprise the at least one PDL CPLs **3810***a*, **3810***b*, **3810***c*, **3810***d*, has been omitted. In this regard, FIG. **38**B roughly corresponds to FIG. **29**A.
(783) In either stage **3805**, **3810**, in some non-limiting examples, an initial conductive coating **830**.sub.0 may be deposited over the at least one semiconducting layer(s) **130***a*-**130***c*. In some non-limiting examples, the initial conductive coating **830**.sub.0 may be deposited using an open mask and/or mask-free deposition process. In some non-limiting examples, such deposition may be effected by exposing the entire exposed layer surface **111** of the device **2900** to a vapor flux of the initial conductive coating material **831**, to deposit the initial conductive coating **830**.sub.0 over the at least one semiconducting layer(s) **130***a*-**130***c* to form a first layer of the at least one second electrode **140**.
(784) In the stage **3805** of FIG. **38**A, the at least one second electrode **140** in the first emissive region **1910***a* has a first thickness that, in some non-limiting examples, may be a common thickness t.sub.c1 in the first emissive region **1910***a*. The first thickness t.sub.c1 may correspond to a thickness of the initial conductive coating **830**.sub.0.
(785) In the stage **3810** of FIG. **38**B, the at least one second electrode **140** may be a common electrode. The second electrode **140***a* has a first thickness t.sub.c1 in the first emissive region **1910***a*. The first thickness t.sub.c1 may correspond to a thickness of the initial conductive coating **830**.sub.0.
(786) In either stage **3805**, **3810**, in some non-limiting examples, a first CPL **3610***a* is selectively deposited over first portions of the device **3800**, comprising the first emissive region **1910***a*.
(787) In either stage **3805**, **3810**, in some non-limiting examples, a first conductive coating **830***a* may be deposited over the device **3800**. In some non-limiting examples, the first conductive coating **830***a* may be deposited using an open mask and/or mask-free deposition process. In some non-limiting examples, such deposition may be effected by exposing the entire exposed layer surface **111** of the device **3800** to a vapour flux of the first conductive coating material **831**, to deposit the first conductive coating **830***a* over the initial conductive coating **830**.sub.0 that is substantially devoid of the first CPL **3610***a*, and in the case of stage **3805** of FIG. **38**A, of the at least one PDL patterning coating **810**, which in some non-limiting examples, comprises the at least one PDL CPLs **3810***a*, **3810***b*, **3810***c*, **3810***d*.
(788) In either stage **3805**, **3810**, in some examples, the first conductive coating **830***a* covers the lateral aspects **410** of the second and third emissive region **1910***b*, **1910***c*, such that the first conductive coating **830***a* forms a second layer of the second electrodes **140***b*, **140***c*. Additionally, in stage **3810**, the first conductive coating **830***a* may, in some non-limiting examples, also cover at least part(s) of the non-emissive region(s) **1920** in which the PDLs **440***a*-**440***d* lie, to form a common electrode, at least for the second emissive region **1910***b*. Such second electrode **140***b* has a second thickness t.sub.c2 in the second emissive region **1910***b*. The second thickness t.sub.c2 may correspond to a combined thickness of the initial conductive coating **830**.sub.0 and of the first conductive coating **830***a* and may in some non-limiting examples be greater than the first thickness t.sub.c1.
(789) Those having ordinary skill in the relevant art will appreciate that, in some non-limiting examples, where the first CPL **3610***a* and/or the at least one PDL CPL **3810***a*, **3810***b*, **3810***c*, **3810***d* do not act as a patterning coating **810**, a patterning coating **810** (not shown) may be disposed where and when appropriate to allow patterning of the first conductive coating **830***a* to be deposited in desired locations, even in the absence of a FMM.
(790) In FIG. **38**C, a stage **3820** of manufacture of the device **3800** is shown that roughly corresponds to FIG. **29**B and assumes that stage **3810** and not stage **3805** has occurred, although

those having ordinary skill in the relevant art will appreciate that a corresponding stage could be described based on stage **3805** instead of stage **3810**.
(791) In some non-limiting examples, a second CPL **3610***b* is selectively deposited over further first portions of the device **3800**, comprising the second emissive region **1910***b*.
(792) In some non-limiting examples, a second conductive coating **830***b* may be deposited over the device **3800**. In some non-limiting examples, the second conductive coating **830***b* may be deposited using an open mask and/or mask-free deposition process. In some non-limiting examples, such deposition may be effected by exposing the entire exposed layer surface **111** of the device **3800** to a vapour flux of a conductive coating material **831**, to deposit the second conductive coating **830***b* over the first conductive coating **830***a* that is substantially devoid of either the first CPL **3610***a* or the second CPL **3610***b* (and/or the at least one patterning coating **810**, which in some non-limiting examples may comprise the at least one PDL CPL **3810***a*, **3810***b*, **3810***c*, **3810***d*), in some examples, the third emissive region **1910***c* and/or in some non-limiting examples, at least part(s) of the non-emissive region **1920** in which the PDLs **440***a*-**440***d* lie, such that the second conductive coating **830***b* is deposited on the further second portion(s) of the first conductive coating **830***a* that are substantially devoid of the second CPL **3610***b* (and/or the at least one patterning coating **810**, which in some non-limiting examples may comprise the at least one PDL CPL **3810***a*, **3810***b*, **3810***c*, **3810***d*) to form a third layer of the second electrode **140***c*.
(793) Such second electrode **140***c* has a third thickness t.sub.c3 in the third emissive region **1910***c*. The third thickness t.sub.c3 may correspond to a combined thickness of the initial conductive coating **830**.sub.0, the first conductive coating **830***a* and the second conductive coating **830***b* and may in some non-limiting examples be greater than either or both of the first thickness t.sub.c1 and the second thickness t.sub.c2.
(794) Those having ordinary skill in the relevant art will appreciate that, in some non-limiting examples, where the first CPL **3610***a*, the second CPL **3610***b*, and/or the at least one PDL CPL **3810***a*, **3810***b*, **3810***c*, **3810***d* do not act as a patterning coating **810**, a patterning coating **810** (not shown) may be disposed where and when appropriate to allow patterning of the third conductive coating **830***c* to be deposited in desired locations, even in the absence of a FMM.
(795) In FIG. **38**D, a stage **3830** of manufacture of the device **3800** is shown that roughly corresponds to FIG. **29**C and assumes that stage **3810** and not stage **3805** has occurred, although those having ordinary skill in the relevant art will appreciate that a corresponding stage could be described based on stage **3805** instead of stage **3810**.
(796) In some non-limiting examples, a third CPL **3810***c* is selectively deposited over additional first portions of the device **3800**, comprising the third emissive region **1910***b*.
(797) In FIG. **38**E, a stage **3840** of manufacture of the device **3800** is shown that roughly corresponds to FIG. **29**D and assumes that stage **3810** and not **3805** has occurred, although those having ordinary skill in the relevant art will appreciate that a corresponding stage could be described based on stage **3805** instead of stage **3810**.
(798) In some non-limiting examples, at least one auxiliary electrode **1750** is disposed in the non-emissive region(s) **1920***a*, **1920***b*, **1920***c*, **1920***d* of the device **3800** between neighbouring emissive region **1910***a*, **1910***b*, **1910***c* thereof and in some non-limiting examples, over the PDLs **440***a*, **440***b*, **440***c*, **440***d*. In some non-limiting examples, a conductive coating material **831** used to deposit the at least one auxiliary electrode **1750** may be deposited using an open mask and/or mask-free deposition process. In some non-limiting examples, such deposition may be effected by exposing the entire exposed layer surface **111** of the device **3800** to a vapour flux of the conductive coating material **831**, to deposit the conductive coating material **831** over the exposed parts of the initial conductive coating **830**.sub.0, the first conductive coating **830***a* and the second conductive coating **830***b* that is substantially devoid of any of the first CPL **3610***a*, the second CPL **3610***b* and/or the third CPL **3610***c* (and/or the at least one patterning coating **810**, which in some non-limiting examples may comprise the at least one PDL CPL **3810***a*, **3810***b*, **3810***c*, **3810***d*), such that

the conductive coating material **831** is deposited on an additional second portion comprising the exposed part(s) of the initial conductive coating **830**.sub.0, the first conductive coating **830***a* and/or the second conductive coating **830***b* that are substantially devoid of any of the first CPL **3610***a*, the second CPL **3610***b* and/or the third CPL **3610***c* (and/or the at least one patterning coating **810**, which in some non-limiting examples may comprise the at least one PDL CPL **3810***a*, **3810***b*, **3810***c*, **3810***d*) to form the at least one auxiliary electrode **1750**. Each of the at least one auxiliary electrodes **1750** is electrically coupled to a respective one of the second electrodes **140***a*-**140***c*. In some non-limiting examples, each of the at least one auxiliary electrodes **1750** is in physical contact with such second electrode **140***a*-**140***c*.
(799) In some non-limiting examples, the first emissive region **1910***a*, the second emissive region **1910***b* and the third emissive region **1910***c* may be substantially devoid of the conductive coating material **831** used to form the at least one auxiliary electrode **1750**.
(800) In some non-limiting examples, at least one of the initial conductive coating **830**.sub.0, the first conductive coating **830***a* and/or the second conductive coating **830***b* may be transmissive and/or substantially transparent in at least a part of the visible wavelength range of the electromagnetic spectrum. Thus, the first conductive coating **830***a* and/or the second conductive coating **830***b* (and/or any additional conductive coating(s) **830**) is disposed on top of the initial conductive coating **830**.sub.0 to form a multi-coating electrode **120**, **140**, **1750** that may also be transmissive and/or substantially transparent in at least a part of the visible wavelength range of the electromagnetic spectrum. In some non-limiting examples, the transmittance of any one or more of the initial conductive coating **830**.sub.0, the first conductive coating **830***a*, the second conductive coating **830***b*, any additional conductive coating(s) **830**, and/or the multi-coating electrode **120**, **140**, **1750** may be greater than about 30%, greater than about 40% greater than about 45%, greater than about 50%, greater than about 60%, greater than about 70%, greater than about 75%, and/or greater than about 80% in at least a part of the visible wavelength range of the electromagnetic spectrum.
(801) In some non-limiting examples, a thickness of the initial conductive coating **830**.sub.0, the first conductive coating **830***a* and/or the second conductive coating **830***b* may be made relatively thin to maintain a relatively high transmittance. In some non-limiting examples, the thickness of the initial conductive coating **830**.sub.0 may be about 5 to 30 nm, about 8 to 25 nm, and/or about 10 to 20 nm. In some non-limiting examples, the thickness of the first conductive coating **830***a* may be about 1 to 25 nm, about 1 to 20 nm, about 1 to 15 nm, about 1 to 10 nm, and/or about 3 to 6 nm. In some non-limiting examples, the thickness of the second conductive coating **830***b* may be about 1 to 25 nm, about 1 to 20 nm, about 1 to 15 nm, about 1 to 10 nm, and/or about 3 to 6 nm. In some non-limiting examples, the thickness of a multi-coating electrode formed by a combination of the initial conductive coating **830**.sub.0, the first conductive coating **830***a*, the second conductive coating **830***b* and/or any additional conductive coating(s) **830** may be about 6 to 35 nm, about 10 to 30 nm, about 10 to 25 nm and/or about 12 to 18 nm.
(802) In some non-limiting examples, a thickness of the at least one auxiliary electrode **1750** may be greater than the thickness of the initial conductive coating **830**.sub.0, the first conductive coating **830***a*, the second conductive coating **830***b*, and/or a common electrode. In some non-limiting examples, the thickness of the at least one auxiliary electrode **1750** may be greater than about 50 nm, greater than about 80 nm, greater than about 100 nm, greater than about 150 nm, greater than about 200 nm, greater than about 300 nm, greater than about 400 nm, greater than about 500 nm, greater than about 700 nm, greater than about 800 nm, greater than about 1 μm, greater than about 1.2 μm, greater than about 1.5 μm, greater than about 2 μm, greater than about 2.5 μm, and/or greater than about 3 μm.
(803) In some non-limiting examples, the at least one auxiliary electrode **1750** may be substantially non-transparent and/or opaque. However, since the at least one auxiliary electrode **1750** may be in some non-limiting examples provided in a non-emissive region **1920** of the device **2900**, the at

least one auxiliary electrode **1750** may not cause or contribute to significant optical interference. In some non-limiting examples, the transmittance of the at least one auxiliary electrode **1750** may be less than about 50%, less than about 70%, less than about 80%, less than about 85%, less than about 90%, and/or less than about 95% in at least a part of the visible wavelength range of the electromagnetic spectrum.

(804) In some non-limiting examples, the at least one auxiliary electrode **1750** may absorb light in at least a part of the visible wavelength range of the electromagnetic spectrum.

(805) In some non-limiting examples, at least one optical property, including without limitation, a thickness, a composition, a total optical path length, and/or a refractive index, of the first CPL **3610***a*, the second CPL **3610***b*, and/or the third CPL **3610***c* disposed in the first emissive region **1910***a*, the second emissive region **1910***b* and/or the third emissive region **1910***c* respectively (and/or the at least one patterning coating **810**, which in some non-limiting examples may comprise the at least one PDL CPL **3810***a*, **3810***b*, **3810***c*, **3810***d* disposed in the non-emissive regions **1920***a*, **1920***b*, **1920***c*, **1920***d*) may be varied according to a colour and/or emission spectrum of light emitted by each emissive region **1910***a*-**1910***c*. As shown in FIGS. **38**D-**38**E, the first CPL **3610***a* may have a first CPL thickness t.sub.n1, the second CPL **3610***b* may have a second CPL thickness t.sub.n2 and/or the third CPL **3610***c* may have a third CPL thickness t.sub.n3. In some non-limiting examples, the first CPL thickness t.sub.n1 may be the same as, greater than, and/or less than, the second CPL thickness t.sub.n2. In some non-limiting examples, the first CPL thickness t.sub.n1 may be the same as, greater than, and/or less than, the third CPL thickness t.sub.n3. In some non-limiting examples, the second CPL thickness t.sub.n2 may be the same as, greater than, and/or less than, the third CPL thickness t.sub.n3.

(806) In some non-limiting examples, it may be advantageous to vary the first CPL thickness t.sub.n1, the second CPL thickness t.sub.n2, and/or the third CPL thickness t.sub.n3 deposited over, respectively, the first emissive region **1910***a*, the second emissive region **1910***b*, and/or the third emissive region **1910***c*, especially, where the first CPL **3610***a*, the second CPL **3610***b*, and/or the third CPL **3610***c* act as a patterning coating **810**.

(807) By adjusting the first CPL thickness t.sub.n1, the second CPL thickness t.sub.n2, and/or the third CPL thickness t.sub.n3 deposited over, respectively, the first emissive region **1910***a*, the second emissive region **1910***b*, and/or the third emissive region **1910***c*, in addition to the first thickness t.sub.c1, the second thickness t.sub.c2, and/or the third thickness t.sub.c3 of, respectively, the second electrode **140***a* in the first emissive region **1910***a*, the second electrode **140***b* in the second emissive region **1910***b*, and/or the second electrode **140***c* in the third emissive region **1910***c*, optical microcavity effects of, respectively, the first emissive region **1910***a*, the second emissive region **1910***b*, and/or the third emissive region **1910***c* may be modulated on a sub-pixel to sub-pixel basis. By way of non-limiting example, a thickness of a CPL **3610***a*, **3610***b*, **3610***c* disposed over a B(lue) sub-pixel **2643** may be less than a thickness of a CPL **3610***a*, **3610***b*, **3610***c* disposed over a G(reen) sub-pixel **2642**. By way of non-limiting examples, a thickness of a CPL **3610***a*, **3610***b*, **3610***c* disposed over a G(reen) sub-pixel **2642** may be less than a thickness of a CPL **3610***a*, **3610***b*, **3610***c* disposed over a R(ed) sub-pixel **2641**.

(808) Those having ordinary skill in the relevant art will appreciate that optical microcavity effects of, respectively, the first emissive region **1910***a*, the second emissive region **1910***b*, and/or the third emissive region **1910***c*, may be controlled to an even greater extent by modulating at least one optical property, including without limitation, a thickness, a composition, a total optical path length, and/or a refractive index, of the initial conductive coating **830**.sub.0, the first conductive coating **830***a*, and/or the second conductive coating **830***b*, in order to modulate at least one optical property, including without limitation, a thickness, a composition, a total optical path length, and/or a refractive index, of the second electrode **140***a*, **140***b*, **140***c* of one emissive region **1910***a*, **1910***b*, **1910***c* of a given sub-pixel **264***x* relative to the at least one optical property, including without limitation, a thickness, a composition, a total optical path length, and/or a refractive index, of the

second electrode **140***a*, **140***b*, **140***c* of another emissive region **1910***a*, **1910***b*, **1910***c* of another sub-pixel **264***x*, in addition to modulating at least one optical property, including without limitation, a thickness, a composition, a total optical path length, and/or a refractive index, of a CPL **3610***a*, **3610***b*, **3610***c* of the one emissive region **1910***a*, **1910***b*, **1910***c* of the given sub-pixel **264***x* relative to at least one optical property, including without limitation, a thickness, a composition, a total optical path length, and/or a refractive index, of a CPL **3610***a*, **3610***b*, **3610***c* of the other emissive region **1910***a*, **1910***b*, **1910***c* of the other sub-pixel **264***x*.

(809) In some non-limiting examples, the device **3800** may also comprise any number of emissive regions **1910***a*-**1910***c* and/or (sub-) pixel(s) **340**/**264***x* thereof. In some non-limiting examples, a device may comprise a plurality of pixels **340**, wherein each pixel **340** comprises two, three or more sub-pixel(s) **264***x*.

(810) Those having ordinary skill in the relevant art will appreciate that the specific arrangement of (sub-) pixel(s) **340**/**264***x* may be varied depending on the device design. In some non-limiting examples, the sub-pixel(s) **264***x* may be arranged according to known arrangement schemes, including without limitation, RGB side-by-side, diamond and/or PenTile®.

(811) Turning now to FIG. **38**F, a stage **3835** of manufacture of the device **3800** is shown that assumes that stage **3830** has just occurred.

(812) After stage **3835**, a further layer, including without limitation, a further CPL **3850**, a TFE, and/or a glass cap, may be deposited over the device **3800**. In some non-limiting examples, the CPL **3850** may be deposited using an open mask and/or mask-free deposition process. In some non-limiting examples, such deposition may be effected by exposing the entire exposed layer surface **111** of the device **3800** to a vapour flux of a CPL material to deposit the CPL **3850** across substantially all of the exposed layer surface **111** of the device **3800**.

(813) In some non-limiting examples, the CPL **3850** is similar to conventional CPLs that comprises a layer, typically formed of a common CPL material and in some non-limiting examples, having a substantially common thickness, that extends across substantially all of the lateral aspect of the device **100**, including without limitation, across all emissive regions **1910** therein.

(814) In some non-limiting examples, the CPL material for depositing the CPL **3850** may be the same and/or different from: the CPL material for depositing the first CPL **3810***a*, the CPL material for depositing the second CPL **3810***b*, the CPL material for depositing the third CPL **3810***c* and/or the CPL material for depositing the at least one PDL CPL **3810***a*, **3810***b*, **3810***c*, and/or **3810***d*.

(815) In some non-limiting examples, the CPL **3850** may additionally act as a patterning coating **810**, in that it exhibits a relatively low initial sticking coefficient for a further conductive coating material **831** (not shown) relative to the exposed layer surface **111** of the underlying surface, and be selectively deposited over first portions of the exposed layer surface **111** of such underlying surface in the example device **3800**, to inhibit deposition of a further conductive coating material **831** thereon.

(816) In some non-limiting examples, there may be a scenario in which it is contemplated to deposit a conductive coating **830** having specific material properties onto an exposed layer surface **111** of a substrate **110** on which such conductive coating **830** is not readily deposited. By way of non-limiting example, pure and/or substantially pure Mg is not typically readily deposited onto an organic surface since there is a low sticking coefficient of Mg on various organic surfaces. Accordingly, in some non-limiting examples, an exposed layer surface **111** on which the initial conductive coating **830**.sub.0, the first conductive coating **830***a*, the second conductive coating **830***b*, and/or the at least one auxiliary electrode **1750** is to be deposited may be treated, prior to deposition of the conductive coating material **831** to form the initial conductive coating **830**.sub.0, the first conductive coating **830***a*, the second conductive coating **830***b*, and/or the at least one auxiliary electrode **1750**, by depositing a patterning coating **1120**, which in some non-limiting examples, may be an NPC **1120**.

(817) In some non-limiting examples, deposition of a patterning coating **1120** for facilitating

deposition of a conductive coating material **831** for a conducting coating **830**, including without limitation, at least one of the initial conductive coating **830**.sub.0, the first conductive coating **830***a*, the second conductive coating **830***b*, and/or the at least one auxiliary electrode **1750**, may occur before and/or after, respectively, a prior deposition of a PDL **3610**, including without limitation, the at least one PDL CPL **3810***a*, **3810***b*, **3810***c*, **3810***d*, the first CPL **3610***a*, the second CPL **3610***b*, and/or the third CPL **3610***c*.
(818) In some non-limiting examples, such a patterning coating **1120** may deposited over portions of an underlying exposed layer surface **111** of, without limitation, the substrate **110**, the at least one semiconducting layer **130**, the at least one PDL **440***a*, **440***b*, **440***c*, **440***d*, the initial conductive coating **830**.sub.0, the first conductive coating **830***a*, and/or the second conductive coating **830***b*, that is substantially devoid of a CPL **3610**, including without limitation, the at least one PDL CPL **3810***a*, **3810***b*, **3810***c*, **3810***d*, the first CPL **3610***a*, the second CPL **3610***b*, and/or the third CPL **3610***c*.
(819) In some non-limiting examples, such a patterning coating **1120** may be deposited at an interface between a CPL **3610**, including without limitation, the first CPL **3610***a*, the second CPL **3610***b*, and/or the third CPL **3610***c*, and an underlying conductive coating **830**, including without limitation, the first conductive coating **830***a*, the second conductive coating **830***b*, and/or the third conductive coating **830***c*.
(820) In FIGS. **38**A-**38**F, the CPLs **3610** are shown as extending substantially only across the lateral extent **410** of one emissive region **1910**. Such a configuration permits one or more conductive coatings **830** to be deposited in regions that, at the time of deposition, are substantially devoid of a CPL **3610**, resulting in a patterned deposition of the conductive coating **830**, without employing an FMM. In some non-limiting examples, again as shown in FIGS. **38**A-**38**F, the deposition of a subsequent CPL **3610** in turn is deposited across the lateral extent **410** of a different emissive region **1910** from that of a previous CPL **3610**, such that the CPL **3610** layers do not overlap.
(821) Such configuration is shown in a simplified example diagram in FIG. **39**A.
(822) A first CPL **3610***a* is deposited on the exposed layer surface **111** of an underlying material, which may, in some non-limiting examples, be an initial conductive coating **830**.sub.0, (substantially only) across the lateral extent **410** of a first emissive region **1910***a*.
(823) A first conductive coating **830***a* is deposited, subsequent to the deposition of the first CPL **3610***a*, and patterned thereby, on the rest of the exposed layer surface **111** of the initial conductive coating **830**.sub.0.
(824) A second CPL **3610***b* is deposited on the exposed layer surface **111** of the first conductive coating **830***a* (substantially only) across the lateral extent **410** of a second emissive region **1910***b*.
(825) A second conductive coating **830***b* is deposited, subsequent to the deposition of the second CPL **3610***b*, and patterned thereby, on the rest of the exposed layer surface **111** of the first conductive coating **830***a*.
(826) A third CPL **3610***c* is deposited on the exposed layer surface **111** of the second conductive coating **830***b* (substantially only) across the lateral extent **410** of a third emissive region **1910***c*.
(827) A third conductive coating **830***c* is deposited, subsequent to the deposition of the third CPL **3610***c*, and patterned thereby, on the exposed layer surface **111** of the second conductive coating **830***b*.
(828) A fourth CPL **3610***d* is deposited on the exposed layer surface **111** of the third conductive coating **830***c* (substantially only) across the lateral extent **410** of a fourth emissive region **1910***d*.
(829) A fourth conductive coating **830***d* is deposited, subsequent to the deposition of the fourth CPL **3610***d*, and patterned thereby, on the exposed layer surface **111** of the third conductive coating **830***c*.
(830) Thus, each of the non-emissive regions **1920***a*, **1920***b*, **1930***c* extending respectively, between the first emissive region **1910***a* and the second emissive region **1910***b*, the second emissive region

1910*b* and the third emissive region **1910***c*, and the third emissive region **1910***c* and the fourth emissive region **1910***d*, are shown with five layers of conductive coating **830** thereon, comprising the initial conductive coating **830**.sub.0, the first conductive coating **830***a*, the second conductive coating **830***b*, the third conductive coating **830***c*, and the fourth conductive coating **830***d*, while each of the fourth emissive region **1910***d*, the third emissive region **1910***c*, the second emissive region **1910***b*, and the first emissive region **1910***a* each have progressively fewer layers of conductive coating **830**, the uppermost of which is covered by a single CPL **3610**.
(831) Those having ordinary skill in the relevant art will appreciate that other configurations involving the deposition of CPLs **3610** may also be employed. By way of non-limiting example, in some non-limiting examples, a subsequent CPL **3610** may be deposited over, and fully overlap, a previous CPL **3610** across the lateral extent **410** of the corresponding emissive region, as well as across the lateral extent **410** of a subsequent emissive region **1910**, and, in some non-limiting examples, over at least a part of the lateral extent **420** of a non-emissive region **1920** extending therebetween.
(832) Such configuration is shown in a simplified example diagram in FIG. **39**B.
(833) A first CPL **3610***a* is deposited on the exposed layer surface **111** of an underlying material, which may, in some non-limiting examples be an initial conductive coating **830**.sub.0, (substantially only) across the lateral extent **410** of a first emissive region **1910***a*.
(834) A first conductive coating **830***a* is deposited, subsequent to the deposition of the first CPL **3610***a*, and patterned thereby, on the rest of the exposed layer surface **111** of the first conductive coating **830***a*.
(835) A second CPL **3610***b* is deposited on the exposed layer surface **111** of the first conductive coating **830***a* across the lateral extent **410** of a second emissive region **1910***b*. However, in addition, the second CPL **3610***b* is deposited on the exposed layer surface **111** of the first conductive coating **830***a* across (at least a part of) the lateral extent **420** of a first non-emissive region **1920***a* extending between the first emissive region **1910***a* and the second emissive region **1910***b*, as well as on the exposed layer surface **111** of the first CPL **3610***a*.
(836) A second conductive coating **830***b* is deposited, subsequent to the deposition of the second CPL **3610***b*, and patterned thereby, on the rest of the exposed layer surface **111** of the first conductive coating **830***a*.
(837) A third CPL **3610***c* is deposited on the exposed layer surface **111** of the second conductive coating **830***b* across the lateral extent of a third emissive region **1910***c*. However, in addition, the third CPL **3610***c* is deposited on the exposed layer surface **111** of the second conductive coating **830***b* across (at least a part of) the lateral extent **420** of a second non-emissive region **1920***b* extending between the second emissive region **1910***b* and the third emissive region **1910***c*, as well as on the exposed layer surface **111** of the second CPL **3610***b*, which extends across the lateral extent **410** of the first emissive region **1910***a*, the second emissive region **1910***b*, and the lateral extent **420** of the first non-emissive region **1920***a* therebetween.
(838) A third conductive coating **830***c* is deposited, subsequent to the deposition of the third CPL **3910***c*, and patterned thereby, on the rest of the exposed layer surface **111** of the second conductive coating **830***b*.
(839) A fourth CPL **3610***d* is deposited on the exposed layer surface **111** of the third conductive coating **830***c* across the lateral extent of a fourth emissive region **1910***d*. However, in addition, the fourth CPL **3610***d* is deposited on the exposed layer surface **111** of the third conductive coating **830***c* across (at least a part of) the lateral extent **420** of a third non-emissive region **1920***c* extending between the third emissive region **1910***c* and the fourth emissive region **1910***d*, as well as on the exposed layer surface **111** of the third CPL **3610***c*, which extends across the lateral extent **410** of the first emissive region **1910**, the second emissive region **1910***b*, and the lateral extent **420** of the first non-emissive region **1920***a* between the first emissive region **1910***a* and the second emissive region **1910***b* and of the second non-emissive region **1920***b* between the second emissive region

1910*b* and the third emissive region **19**
(840) Thus, each of the fourth emissive region **1910***d*, the third emissive region **1910***c*, the second emissive region, and the first emissive region **1910***a*, as well as the third non-emissive region **1920***c*, the second non-emissive region **1920***b*, and the first non-emissive region **1920***a*, have progressively fewer layers of conductive coating **830**, the uppermost of which is covered by a progressively larger number of layers of CPL **3610**, so that each region has the same number of layers thereon, whether of a conductive coating **830** or of a CPL **3610**.
(841) In some non-limiting examples, a subsequent CPL **3610** may be deposited over, but only partially overlap, a previous CPL **3610**. In some non-limiting examples, each CPL **3610** may extend across the lateral extent **410** of a plurality of emissive regions **1910**, and the lateral aspect **420** of at least one non-emissive region **1920** therebetween.
(842) Such configuration is shown in a simplified example diagram in FIG. **39**C.
(843) A first CPL **3610***a* is deposited on the exposed layer surface **111** of an underlying material, which may, in some non-limiting examples, be an initial conductive coating **830**.sub.0, across, and in some non-limiting examples, extending beyond the lateral extent **410** of a first emissive region **1910***a*. In the example shown, the first CPL **3610***a* extends across the lateral extent **410** of both the first emissive region **1910***a* and of a second emissive region **1910***b*, as well as the lateral extent **420** of a first non-emissive region **1920***a* therebetween.
(844) A first conductive coating **830***a* is deposited, subsequent to the deposition of the first CPL **3610***a*, and patterned thereby, on the rest of the exposed layer surface **111** of the initial conductive coating **830**.sub.0.
(845) A second CPL **3610***b* is deposited on the exposed layer surface **111** of a part of both the first conductive coating **830***a* and the first CPL **3610***a*, across, and in some non-limiting examples, extending beyond the lateral extent **410** of the second emissive region **1910***b*. In the example shown, the second CPL **3610***b* extends across the lateral extent **410** of both the second emissive region **1910***b* and of a third emissive region **1910***c*, as well as the lateral extent **420** of a second non-emissive region **1920***b* therebetween.
(846) A second conductive coating **830***c* is deposited, subsequent to the deposition of the second CPL **3610***b*, and patterned thereby, on the rest of the exposed layer surface **111** of the first conductive coating **830***a*.
(847) A third CPL **3610***c* is deposited on the exposed layer surface **111** of a part of both the second conductive coating **830***b* and the second CPL **3610***b*, across, and in some non-limiting examples, extending beyond the lateral extent **410** of the third emissive region **1910***c*. In the example shown, the third CPL **3610***c* extends across the lateral extent **410** of both the third emissive region **1910***c* and of a fourth emissive region **1910***d*, as well as the lateral extent **420** of a third non-emissive region **1920***c* therebetween.
(848) Thus, some of the emissive regions **1910**, including without limitation, the second emissive region **1910***b* and the third emissive region **1910***c* each have a plurality of layers of CPL **3610** covering a progressively larger number of layers of conductive coating **830**.
(849) NPCs
(850) Without wishing to be bound by a particular theory, it is postulated that providing an NPC **1120** may facilitate deposition of the conductive coating **830** onto certain surfaces.
(851) Non-limiting examples of suitable materials for forming an NPC **1120** include without limitation, at least one of metals, including without limitation, alkali metals, alkaline earth metals, transition metals and/or post-transition metals, metal fluorides, metal oxides and/or fullerene.
(852) In the present disclosure, the term “fullerene” may refer generally to a material including carbon molecules. Non-limiting examples of fullerene molecules include carbon cage molecules, including without limitation, a three-dimensional skeleton that includes multiple carbon atoms that form a closed shell and which may be, without limitation, spherical and/or semi-spherical in shape. In some non-limiting examples, a fullerene molecule can be designated as C.sub.n, where n is an

integer corresponding to a number of carbon atoms included in a carbon skeleton of the fullerene molecule. Non-limiting examples of fullerene molecules include where n is in the range of 50 to 250, such as, without limitation, C.sub.70, C.sub.70, C.sub.72, C.sub.74, C.sub.76, C.sub.78, C.sub.80, C.sub.82, and C.sub.84. Additional non-limiting examples of fullerene molecules include carbon molecules in a tube and/or a cylindrical shape, including without limitation, single-walled carbon nanotubes and/or multi-walled carbon nanotubes.
(853) Non-limiting examples of such materials include Ca, Ag, Mg, Yb, ITO, IZO, ZnO, ytterbium fluoride (YbF.sub.3), magnesium fluoride (MgF.sub.2) and/or cesium fluoride (CsF).
(854) Based on findings and experimental observations, it is postulated that nucleation promoting materials, including without limitation, fullerenes, metals, including without limitation, Ag and/or Yb, and/or metal oxides, including without limitation, ITO and/or IZO, as discussed further herein, may act as nucleation sites for the deposition of a conductive coating **830**, including without limitation Mg.
(855) In some non-limiting examples, the NPC **1120** may be provided by a part of the at least one semiconducting layer **130**. By way of non-limiting example, a material for forming the EIL **139** may be deposited using an open mask and/or mask-free deposition process to result in deposition of such material in both an emissive region **1910** and/or a non-emissive region **1920** of the device **100**. In some non-limiting examples, a part of the at least one semiconducting layer **130**, including without limitation the EIL **139**, may be deposited to coat one or more surfaces in the sheltered region **3065**. Non-limiting examples of such materials for forming the EIL **139** include at least one or more of alkali metals, including without limitation, Li, alkaline earth metals, fluorides of alkaline earth metals, including without limitation, MgF.sub.2, fullerene, Yb, YbF.sub.3, and/or CsF.
(856) In some non-limiting examples, the NPC **1120** may be provided by the second electrode **140** and/or a portion, layer and/or material thereof. In some non-limiting examples, the second electrode **140** may extend laterally to cover the layer surface **3111** arranged in the sheltered region **3065**. In some non-limiting examples, the second electrode **140** may comprise a lower layer thereof and a second layer thereof, wherein the second layer thereof is deposited on the lower layer thereof. In some non-limiting examples, the lower layer of the second electrode **140** may comprise an oxide such as, without limitation, ITO, IZO and/or ZnO. In some non-limiting examples, the upper layer of the second electrode **140** may comprise a metal such as, without limitation, at least one of Ag, Mg, Mg:Ag, Yb/Ag, other alkali metals and/or other alkali earth metals.
(857) In some non-limiting examples, the lower layer of the second electrode **140** may extend laterally to cover a surface of the sheltered region **3065**, such that it forms the NPC **1120**. In some non-limiting examples, one or more surfaces defining the sheltered region **3065** may be treated to form the NPC **1120**. In some non-limiting examples, such NPC **1120** may be formed by chemical and/or physical treatment, including without limitation, subjecting the surface(s) of the sheltered region **3065** to a plasma, UV and/or UV-ozone treatment.
(858) Without wishing to be bound to any particular theory, it is postulated that such treatment may chemically and/or physically alter such surface(s) to modify at least one property thereof. By way of non-limiting example, such treatment of the surface(s) may increase a concentration of C—O and/or C—OH bonds on such surface(s), increase a roughness of such surface(s) and/or increase a concentration of certain species and/or functional groups, including without limitation, halogens, nitrogen-containing functional groups and/or oxygen-containing functional groups to thereafter act as an NPC **1120**.
(859) In some non-limiting examples, the partition **3221** includes and/or if formed by an NPC **1120**. By way of non-limiting examples, the auxiliary electrode **1750** may act as an NPC **1120**.
(860) In some non-limiting examples, suitable materials for use to form an NPC **1120**, may include those exhibiting or characterized as having an initial sticking probability S.sub.0 for a material of a conductive coating **830** of at least about 0.4 (or 40%), at least about 0.5, at least about 0.6, at least

about 0.7, at least about 0.75, at least about 0.8, at least about 0.9, at least about 0.93, at least about 0.95, at least about 0.98, and/or at least about 0.99.
(861) By way of non-limiting example, in scenarios where Mg is deposited using without limitation, an evaporation process on a fullerene-treated surface, in some non-limiting examples, the fullerene molecules may act as nucleation sites that may promote formation of stable nuclei for Mg deposition.
(862) In some non-limiting examples, less than a monolayer of an NPC **1120**, including without limitation, fullerene, may be provided on the treated surface to act as nucleation sites for deposition of Mg.
(863) In some non-limiting examples, treating a surface by depositing several monolayers of an NPC **1120** thereon may result in a higher number of nucleation sites and accordingly, a higher initial sticking probability S_0.
(864) Those having ordinary skill in the relevant art will appreciate than an amount of material, including without limitation, fullerene, deposited on a surface, may be more, or less than one monolayer. By way of non-limiting example, such surface may be treated by depositing 0.1 monolayer, 1 monolayer, 10 monolayers, or more of a nucleation promoting material and/or a nucleation inhibiting material.
(865) In some non-limiting examples, a thickness of the NPC **1120** deposited on an exposed layer surface **111** of underlying material(s) may be between about 1 nm and about 5 nm and/or between about 1 nm and about 3 nm.
(866) While the present disclosure discusses thin film formation, in reference to at least one layer and/or coating, in terms of vapor deposition, those having ordinary skill in the relevant art will appreciate that, in some non-limiting examples, various components of the electro-luminescent device **100** may be deposited using a wide variety of techniques, including without limitation, evaporation (including without limitation, thermal evaporation and/or electron beam evaporation), photolithography, printing (including without limitation, ink jet and/or vapor jet printing, reel-to-reel printing and/or micro-contact transfer printing), PVD (including without limitation, sputtering), CVD (including without limitation, PECVD and/or OVPD), laser annealing, LITI patterning, ALD, coating (including without limitation, spin coating, dip coating, line coating and/or spray coating), and/or combinations of any two or more thereof. Such processes may be used in combination with a shadow mask to achieve various patterns.
(867) NICs
(868) Without wishing to be bound by a particular theory, it is postulated that, during thin film nucleation and growth at and/or near an interface between the exposed layer surface **111** of the substrate **110** and the NIC **810**, a relatively high contact angle θ, between the edge of the film and the substrate **110** be observed due to “dewetting” of the solid surface of the thin film by the NIC **810**. Such dewetting property may be driven by minimization of surface energy between the substrate **110**, thin film, vapor **7** and the NIC **810** layer. Accordingly, it may be postulated that the presence of the NIC **810** and the properties thereof may have, in some non-limiting examples, an effect on nuclei formation and a growth mode of the edge of the conductive coating **830**.
(869) Without wishing to be bound by a particular theory, it is postulated that, in some non-limiting examples, the contact angle θ_c of the conductive coating **830** may be determined, based at least partially on the properties (including, without limitation, initial sticking probability S_0) of the NIC **810** disposed adjacent to the area onto which the conductive coating **830** is formed. Accordingly, NIC **810** material that allow selective deposition of conductive coatings **830** exhibiting relatively high contact angles θ_c may provide some benefit.
(870) Without wishing to be bound by a particular theory, it is postulated that, in some non-limiting examples, the relationship between various interfacial tensions present during nucleation and growth may be dictated according to Young's equation in capillarity theory:
$$\gamma_{sv}=\gamma_{fs}+\gamma_{vf}\cos\theta$$

wherein γ.sub.sv corresponds to the interfacial tension between substrate **110** and vapor, γ.sub.fs corresponds to the interfacial tension between the thin film and the substrate **110**, γ.sub.vf corresponds to the interfacial tension between the vapor and the film, and θ is the film nucleus contact angle. FIG. **40** illustrates the relationship between the various parameters represented in this equation.

(871) On the basis of Young's equation, it may be derived that, for island growth, the film nucleus contact angle θ is greater than 0 and therefore γ.sub.sv<γ.sub.fs+γ.sub.vf.

(872) For layer growth, where the deposited film “wets” the substrate **110**, the nucleus contact angle θ=0, and therefore γ.sub.sv=γ.sub.fs+γ.sub.vf.

(873) For Stranski-Krastanov (S-K) growth, where the strain energy per unit area of the film overgrowth is large with respect to the interfacial tension between the vapor and the film, γ.sub.sv>γ.sub.fs+γ.sub.vf.

(874) It may be postulated that the nucleation and growth mode of the conductive coating **830** at an interface between the NIC **810** and the exposed layer surface **111** of the substrate **110** may follow the island growth model, where θ>0. Particularly in cases where the NIC **810** exhibits a relatively low affinity and/or low initial sticking probability S.sub.0 (i.e. dewetting) towards the material used to form the conductive coating **830**, resulting in a relatively high thin film contact angle of the conductive coating **830**. On the contrary, when a conductive coating **830** is selectively deposited on a surface without the use of an NIC **810**, by way of non-limiting example, by employing a shadow mask, the nucleation and growth mode of the conductive coating **830** may differ. In particular, it has been observed that the conductive coating **830** formed using a shadow mask patterning process may, at least in some non-limiting examples, exhibit relatively low thin film contact angle of less than about 10°.

(875) Those having ordinary skill in the relevant art will appreciate that, while not explicitly illustrated, a material used to form the NIC **810** may also be present to some extent at an interface between the conductive coating **830** and an underlying surface (including without limitation, a surface of a NPC **1120** layer and/or the substrate **110**). Such material may be deposited as a result of a shadowing effect, in which a deposited pattern is not identical to a pattern of a mask and may, in some non-limiting examples, result in some evaporated material being deposited on a masked part of a target surface **111**. By way of non-limiting examples, such material may form as islands and/or disconnected clusters, and/or as a thin film having a thickness that may be substantially less than an average thickness of the NIC **810**.

(876) In some non-limiting examples, it may be desirable for the activation energy for desorption (E.sub.des **631**) to be less than about 2 times the thermal energy (k.sub.BT), less than about 1.5 times the thermal energy (k.sub.BT), less than about 1.3 times the thermal energy (k.sub.BT), less than about 1.2 times the thermal energy (k.sub.BT), less than the thermal energy (k.sub.BT), less than about 0.8 times the thermal energy (k.sub.BT), and/or less than about 0.5 times the thermal energy (k.sub.BT). In some non-limiting examples, it may be desirable for the activation energy for surface diffusion (E.sub.s **621**) to be greater than the thermal energy (k.sub.BT), greater than about 1.5 times the thermal energy (k.sub.BT), greater than about 1.8 times the thermal energy (k.sub.BT), greater than about 2 times the thermal energy (k.sub.BT), greater than about 3 times the thermal energy (k.sub.BT), greater than about 5 times the thermal energy (k.sub.BT), greater than about 7 times the thermal energy (k.sub.BT), and/or greater than about 10 times the thermal energy (k.sub.BT).

(877) In some non-limiting examples, suitable materials for use to form an NIC **810**, may include those exhibiting and/or characterized as having an initial sticking probability S.sub.0 for a material of a conductive coating **830** of no greater than and/or less than about 0.3 (or 30%), no greater than and/or less than about 0.2, no greater than and/or less than about 0.1, no greater than and/or less than about 0.05, no greater than and/or less than 0.03, no greater than and/or less than 0.02, no greater than and/or less than 0.01, no greater than and/or less than about 0.08, no greater than

and/or less than about 0.005, no greater than and/or less that about 0.003, no greater than and/or less than about 0.001, no greater than and/or less than about 0.0008, no greater than and/or less than about 0.0005, and/or no greater than and/or less than about 0.0001.

(878) In some non-limiting examples, suitable materials for use to form an NIC **810** include those exhibiting and/or characterized has having initial sticking probability S.sub.0 for a material of a conductive coating **830** of between about 0.03 and about 0.0001, between about 0.03 and about 0.0003, between about 0.03 and about 0.0005, between about 0.03 and about 0.0008, between about 0.03 and about 0.001, between about 0.03 and about 0.005, between about 0.03 and about 0.008, between about 0.03 and about 0.01, between about 0.02 and about 0.0001, between about 0.02 and about 0.0003, between about 0.02 and about 0.0005, between about 0.02 and about 0.0008, between about 0.02 and about 0.0005, between about 0.02 and about 0.0008, between about 0.02 and about 0.001, between about 0.02 and about 0.005, between about 0.02 and about 0.008, between about 0.02 and about 0.01, between about 0.01 and about 0.0001, between about 0.01 and about 0.0003, between about 0.01 and about 0.0005, between about 0.01 and about 0.0008, between about 0.01 and about 0.001, between about 0.01 and about 0.005, between about 0.01 and about 0.008, between about 0.008 and about 0.0001, between about 0.008 and about 0.0003, between about 0.008 and about 0.0005, between about 0.008 and about 0.0008, between about 0.008 and about 0.001, between about 0.008 and about 0.005, between about 0.005 and about 0.0001, between about 0.005 and about 0.0003, between about 0.005 and about 0.0005, between about 0.005 and about 0.0008, and/or between about 0.005 and about 0.001.

(879) In some non-limiting examples, suitable materials for use to form an NIC **810**, may include organic materials, such as small molecule organic materials and/or organic polymers. Non-limiting examples of suitable organic materials include without limitation polycyclic aromatic compounds including without limitation organic molecules, including without limitation, optionally one or more heteroatoms, including without limitation, nitrogen (N), sulfur (S), oxygen (O), phosphorus (P) and/or Al. In some non-limiting examples, a polycyclic aromatic compound may include, without limitation, organic molecules each including a core moiety and at least one terminal moiety bonded to the core moiety. A non-limiting number of terminal moieties may be 1 or more, 2 or more, 3 or more, and/or 4 or more. Without limiting the generality of the foregoing, in the case of 2 or more terminal moieties, the terminal moieties may be the same and/or different, and/or a subset of the terminal moieties may be the same but different from at least one remaining moiety.

(880) Suitable nucleation inhibiting materials include organic materials, such as small molecule organic materials and organic polymers.

(881) Non-limiting examples of suitable materials for use to form an NIC **810** include at least one material described in at least one of U.S. Pat. No. 10,270,033, PCT International Application No. PCT/IB2018/052881, PCT International Application No. PCT/IB2019/053706 and/or PCT International Application No. PCT/IB2019/050839. In some non-limiting examples, materials that may be used to form a nucleation inhibiting coating include polymeric materials, including without limitation: fluoropolymers, including but not limited to perfluorinated polymers and polytetrafluoroethylene (PTFE); polyvinylbiphenyl; polyvinylcarbazole (PVK); and polymers formed by polymerizing a plurality of the polycyclic aromatic compounds as described above. In some non-limiting examples, materials that may be sued to form a nucleation inhibiting coating include, without limitation, TAZ, BAlq, and any mixture thereof.

(882) In some non-limiting examples, the NIC **810** may act as an optical coating. In some non-limiting examples, the NIC **810** may modify at least property and/or characteristic of the light emitted from at least one emissive region **1910** of the device **100**. In some non-limiting examples, the NIC **810** may exhibit a degree of haze, causing emitted light to be scattered. In some non-limiting examples, the NIC **810** may comprise a crystalline material for causing light transmitted therethrough to be scattered. Such scattering of light may facilitate enhancement of the outcoupling of light from the device in some non-limiting examples, In some non-limiting examples, the NIC

810 may initially be deposited as a substantially non-crystalline, including without limitation, substantially amorphous, coating, whereupon, after deposition thereof, the NIC **810** may become crystallized and thereafter serve as an optical coupling.
(883) As discussed previously, in some non-limiting examples, one or more of the CPLs **3610** may act as an NIC **810**, and may, in some non-limiting examples, exhibit behaviour described herein.
(884) Where features or aspects of the present disclosure are described in terms of Markush groups, it will be appreciated by those having ordinary skill in the relevant art that the present disclosure is also thereby described in terms of any individual member of sub-group of members of such Markush group.
Terminology
(885) References in the singular form include the plural and vice versa, unless otherwise noted.
(886) As used herein, relational terms, such as “first” and “second”, and numbering devices such as “a”, “b” and the like, may be used solely to distinguish one entity or element from another entity or element, without necessarily requiring or implying any physical or logical relationship or order between such entities or elements.
(887) The terms “including” and “comprising” are used expansively and in an open-ended fashion, and thus should be interpreted to mean “including, but not limited to”. The terms “example” and “exemplary” are used simply to identify instances for illustrative purposes and should not be interpreted as limiting the scope of the invention to the stated instances. In particular, the term “exemplary” should not be interpreted to denote or confer any laudatory, beneficial or other quality to the expression with which it is used, whether in terms of design, performance or otherwise.
(888) The terms “couple” and “communicate” in any form are intended to mean either a direct connection or indirect connection through some interface, device, intermediate component or connection, whether optically, electrically, mechanically, chemically, or otherwise.
(889) The terms “on” or “over” when used in reference to a first component relative to another component, and/or “covering” or which “covers” another component, may encompass situations where the first component is directly on (including without limitation, in physical contact with) the other component, as well as cases where one or more intervening components are positioned between the first component and the other component.
(890) Amounts, ratios and/or other numerical values are sometimes presented herein in a range format. Such range formats are used for convenience, illustration and brevity and should be understood flexibly to include not only numerical values explicitly specified as limits of a range, but also all individual numerical values and/or sub-ranges encompassed within that range as if each numerical value and/or sub-range had been explicitly specified.
(891) Directional terms such as “upward”, “downward”, “left” and “right” are used to refer to directions in the drawings to which reference is made unless otherwise stated. Similarly, words such as “inward” and “outward” are used to refer to directions toward and away from, respectively, the geometric center of the device, area or volume or designated parts thereof. Moreover, all dimensions described herein are intended solely to be by way of example of purposes of illustrating certain embodiments and are not intended to limit the scope of the disclosure to any embodiments that may depart from such dimensions as may be specified.
(892) As used herein, the terms “substantially”, “substantial”, “approximately” and/or “about” are used to denote and account for small variations. When used in conjunction with an event or circumstance, such terms can refer to instances in which the event or circumstance occurs precisely, as well as instances in which the event or circumstance occurs to a close approximation. By way of non-limiting example, when used in conjunction with a numerical value, such terms may refer to a range of variation of less than or equal to ±10% of such numerical value, such as less than or equal to ±5%, less than or equal to ±4%, less than or equal to ±3%, less than or equal to ±2%, less than or equal to ±1%, less than or equal to ±0.5%, less than or equal to ±0.1%, and/or less than equal to ±0.05%.

(893) As used herein, the phrase "consisting substantially of" will be understood to include those elements specifically recited and any additional elements that do not materially affect the basic and novel characteristics of the described technology, while the phrase "consisting of" without the use of any modifier, excludes any element not specifically recited.
(894) As will be understood by those having ordinary skill in the relevant art, for any and all purposes, particularly in terms of providing a written description, all ranges disclosed herein also encompass any and all possible sub-ranges and/or combinations of sub-ranges thereof. Any listed range may be easily recognized as sufficiently describing and/or enabling the same range being broken down at least into equal fractions thereof, including without limitation, halves, thirds, quarters, fifths, tenths etc. As a non-limiting example, each range discussed herein may be readily be broken down into a lower third, middle third and/or upper third, etc.
(895) As will also be understood by those having ordinary skill in the relevant art, all language and/or terminology such as "up to", "at least", "greater than", "less than", and the like, may include and/or refer the recited range(s) and may also refer to ranges that may be subsequently broken down into sub-ranges as discussed herein.
(896) As will be understood by those having ordinary skill in the relevant art, a range includes each individual member of the recited range.
General
(897) The purpose of the Abstract is to enable the relevant patent office or the public generally, and specifically, persons of ordinary skill in the art who are not familiar with patent or legal terms or phraseology, to quickly determine from a cursory inspection, the nature of the technical disclosure. The Abstract is neither intended to define the scope of this disclosure, nor is it intended to be limiting as to the scope of this disclosure in any way.
(898) The structure, manufacture and use of the presently disclosed examples have been discussed above. The specific examples discussed are merely illustrative of specific ways to make and use the concepts disclosed herein, and do not limit the scope of the present disclosure. Rather, the general principles set forth herein are considered to be merely illustrative of the scope of the present disclosure.
(899) It should be appreciated that the present disclosure, which is described by the claims and not by the implementation details provided, and which can be modified by varying, omitting, adding or replacing and/or in the absence of any element(s) and/or limitation(s) with alternatives and/or equivalent functional elements, whether or not specifically disclosed herein, will be apparent to those having ordinary skill in the relevant art, may be made to the examples disclosed herein, and may provide many applicable inventive concepts that may be embodied in a wide variety of specific contexts, without straying from the present disclosure.
(900) In particular, features, techniques, systems, sub-systems and methods described and illustrated in one or more of the above-described examples, whether or not described an illustrated as discrete or separate, may be combined or integrated in another system without departing from the scope of the present disclosure, to create alternative examples comprised of a combination or sub-combination of features that may not be explicitly described above, or certain features may be omitted, or not implemented. Features suitable for such combinations and sub-combinations would be readily apparent to persons skilled in the art upon review of the present application as a whole. Other examples of changes, substitutions, and alterations are easily ascertainable and could be made without departing from the spirit and scope disclosed herein.
(901) All statements herein reciting principles, aspects and examples of the disclosure, as well as specific examples thereof, are intended to encompass both structural and functional equivalents thereof and to cover and embrace all suitable changes in technology. Additionally, it is intended that such equivalents include both currently-known equivalents as well as equivalents developed in the future, i.e., any elements developed that perform the same function, regardless of structure.
(902) Accordingly, the specification and the examples disclosed therein are to be considered

illustrative only, with a true scope of the disclosure being disclosed by the following numbered claims:

Claims

1. An opto-electronic device having a plurality of layers, comprising: a first capping layer (CPL) comprising a first CPL material and disposed in a first emissive region, the first emissive region configured to emit photons through the first CPL having a first wavelength spectrum that is characterized by a first onset wavelength; and a second CPL comprising a second CPL material and disposed in a second emissive region, the second emissive region configured to emit photons through the second CPL having a second wavelength spectrum that is characterized by a second onset wavelength that is different from the first onset wavelength; wherein: at least one of: the first CPL, and the first CPL material, (CPL(m)1) exhibits a first absorption edge at a first absorption edge wavelength that is shorter than the first onset wavelength; and at least one of: the second CPL, and the second CPL material, (CPL(m)2) exhibits a second absorption edge at a second absorption edge wavelength that is shorter than the second onset wavelength.
2. An opto-electronic device having a plurality of layers, comprising: a first capping layer (CPL) comprising a first CPL material and disposed in a first emissive region, the first emissive region configured to emit photons through the first CPL having a first wavelength spectrum that is characterized by a first onset wavelength; and a second CPL comprising a second CPL material and disposed in a second emissive region, the second emissive region configured to emit photons through the second CPL having a second wavelength spectrum that is characterized by a second onset wavelength that is different from the first onset wavelength; wherein at least one of the following is true: at least one of: the first CPL, and the first CPL material, (CPL(m)1) exhibits a first refractive index in at least one wavelength in the first wavelength spectrum that is one of at least about: 1.8, 1.9, 1.95, 2.0, 2.05, 2.1, 2.2, 2.3, and 2.5; and at least one of: the second CPL, and the second CPL material, (CPL(m)2) exhibits a second refractive index in at least one wavelength in the second wavelength spectrum that is one of at least about: 1.8, 1.9, 1.95, 2.0, 2.05, 2.1, 2.2, 2.3, and 2.5.
3. The opto-electronic device of claim 2, wherein the first onset wavelength is no more than the second onset wavelength.
4. The opto-electronic device of claim 2 wherein the first wavelength spectrum and the second wavelength spectrum lie in the visible spectrum.
5. The opto-electronic device of claim 2, wherein the first wavelength spectrum corresponds to a colour that is one of: B(lue), and G(reen).
6. The opto-electronic device of claim 2, wherein the second wavelength spectrum corresponds to a colour that is one of: G(reen) and R(ed).
7. The opto-electronic device of claim 2, wherein the first wavelength spectrum corresponds to a colour that is B(lue), and the second wavelength spectrum corresponds to a colour that is one of: G(reen) and R(ed).
8. The opto-electronic device of claim 2, wherein the first wavelength spectrum corresponds to a colour that is G(reen), and the second wavelength spectrum corresponds to a colour that is R(ed).
9. The opto-electronic device of claim 2, wherein at least one of the following is true: the at least one wavelength in the first wavelength spectrum is one of: the first onset wavelength, and a first peak wavelength of the first wavelength spectrum, and the at least one wavelength in the second wavelength spectrum is one of: the second onset wavelength and a second peak wavelength of the second wavelength spectrum.
10. The opto-electronic device of claim 9, wherein the first peak wavelength is no more than the second peak wavelength.
11. The opto-electronic device of claim 9, wherein the first onset wavelength is a shortest one of at

least one wavelength of the first wavelength spectrum at which an intensity is one of about: 20%, 15%, 10%, 5%, 3%, 1%, and 0.1%, of an intensity at the first peak wavelength.

12. The opto-electronic device of claim 9, wherein the second onset wavelength is a shortest one of at least one wavelength of the second wavelength spectrum at which an intensity is one of about: 20%, 15%, 10%, 5%, 3%, 1%, and 0.1%, of an intensity at the first peak wavelength.

13. The opto-electronic device of claim 9, further comprising a third CPL comprising a third CPL material and disposed in a third emissive region, the third emissive region configured to emit photons through the third CPL having a third wavelength spectrum that is characterized by a third onset wavelength that is characterized by a third onset wavelength that is different from at least one of: the first onset wavelength, and the second onset wavelength, wherein at least one of: the third CPL, and the third CPL material, (CPL(m)3) exhibits a third refractive index in at least one wavelength in the third wavelength spectrum that is one of at least about: 1.8, 1.9, 1.95, 2.0, 2.05, 2.1, 2.2, 2.3, and 2.5.

14. The opto-electronic device of claim 13, wherein the first wavelength spectrum corresponds to a colour that is B(lue), the second wavelength spectrum corresponds to a colour that is G(reen), and the third wavelength spectrum corresponds to a colour that is R(ed).

15. The opto-electronic device of claim 13, wherein the at least one wavelength in the third wavelength spectrum is one of: the third onset wavelength, and a third peak wavelength of the third wavelength spectrum.

16. The opto-electronic device of claim 15, wherein the third peak wavelength is no more than the second peak wavelength and at least that of the first peak wavelength.

17. The opto-electronic device of claim 13, wherein at least one of: a thickness, morphology, and material composition, of the third CPL is tuned to provide the third refractive index.

18. The opto-electronic device of claim 13, wherein the CPL(m)3 exhibits a third absorption edge at a third absorption edge wavelength.

19. The opto-electronic device of claim 18, wherein the refractive index of the CPL(m)3 for at least one wavelength longer than the third absorption edge wavelength is at least the refractive index of the CPL(M)3 for at least one wavelength shorter than the third absorption edge wavelength.

20. The opto-electronic device of claim 18, wherein the third absorption edge wavelength is shorter than the third onset wavelength.

21. The opto-electronic device of claim 18, wherein a difference between the third onset wavelength and the third absorption edge wavelength is one of no more than about: 200 nm, 150 nm, 130 nm, 100 nm, 80 nm, 70 nm, 60 nm, 50 nm, 40 nm, 35 nm, 25 nm, 20 nm, 14 nm, and 10 nm.

22. The opto-electronic device of claim 18, wherein the third absorption edge is characterized by a third extinction wavelength in a third extinction wavelength spectrum at which an extinction coefficient of the CPL(m)3 equals a threshold value.

23. The opto-electronic device of claim 22, wherein the third extinction wavelength is a longest one of at least one wavelength in the third extinction wavelength spectrum at which the extinction coefficient of the CPL(m)3 equals the threshold value.

24. The opto-electronic device of claim 22, wherein a first derivative of the extinction coefficient of the CPL(m)3 as a function of wavelength is negative at the third extinction wavelength.

25. The opto-electronic device of claim 22, wherein the extinction coefficient of the CPL(m)1 at at least one wavelength longer than the third extinction wavelength is no more than the threshold value.

26. The opto-electronic device of claim 22, wherein the extinction coefficient of the CPL(m)3 at a wavelength longer than the third onset wavelength is one of no more than about; 0.1, 0.09, 0.08, 0.06, 0.05, 0.03, 0.01, 0.005, and 0.0001.

27. The opto-electronic device of claim 22, wherein the extinction coefficient of the CPL(m)3 at a wavelength shorter than the third absorption edge wavelength is one of at least about: 0.1, 0.12,

0.13, 0.15, 0.18, 0.2, 0.25, 0.3, 0.5, 0.7, 0.75, 0.8, 0.9, and 1.0.
28. The opto-electronic device of claim 13, wherein the third CPL acts as a patterning coating having an initial sticking coefficient of a conductive coating material for an exposed layer surface thereof that is low relative to the initial sticking coefficient for an exposed layer surface of an underlying surface on which the patterning coating has been deposited.
29. The opto-electronic device of claim 2, wherein at least one of the following is true: at least one of: a thickness, morphology, and material composition, of the first CPL is tuned to provide the first refractive index, and at least one of: a thickness, morphology, and material composition, of the second CPL is tuned to provide the second refractive index.
30. The opto-electronic device of claim 2, wherein a refractive index of the CPL(m)1 for at least one wavelength in the first wavelength spectrum exceeds the refractive index of the CPL(m)1 for at least one wavelength in the second wavelength spectrum.
31. The opto-electronic device of claim 2, wherein a refractive index of the CPL(m)2 for at least one wavelength in the second wavelength spectrum exceeds the refractive index of the CPL(m)2 for at least one wavelength in the first wavelength spectrum.
32. The opto-electronic device of claim 2, wherein a refractive index of at least one of: the CPL(m)1 for at least one wavelength of the second wavelength spectrum, and the CPL(m)2 for at least one wavelength of the first wavelength spectrum, is one of no more than about: 1.8 1.7, 1.65, 1.6, 1.5, 1.45, 1.4, and 1.3.
33. The opto-electronic device of claim 2, wherein the CPL(m)1 exhibits a first absorption edge at a first absorption edge wavelength and the CPL(m)2 exhibits a second absorption edge at a second absorption edge wavelength.
34. The opto-electronic device of claim 33, wherein at least one of the following is true: the refractive index of the CPL(m)1 for at least one wavelength longer than the first absorption edge wavelength is at least the refractive index of the CPL(m)1 for at least one wavelength shorter than the first absorption edge wavelength; and the refractive index of the CPL(m)2 for at least one wavelength longer than the second absorption edge wavelength is at least the refractive index of the CPL(m)2 for at least one wavelength shorter than the second absorption edge wavelength.
35. The opto-electronic device of claim 33, wherein at least one of the following is true: the first absorption edge wavelength is shorter than the first onset wavelength, and the second absorption edge wavelength is shorter than the second onset wavelength.
36. The opto-electronic device of claim 33, wherein a difference between the first onset wavelength and the first absorption edge wavelength is one of no more than about; 50 nm, 40 nm, 35 nm, 30 nm, 25 nm, 20 nm, 15 nm, 10 nm, 5 nm, and 3 nm.
37. The opto-electronic device of claim 33, wherein a difference between the second onset wavelength and the second absorption edge wavelength is one of no more than about: 200 nm, 150 nm, 130 nm, 100 nm, 80 nm, 70 nm, 60 nm, 50 nm, 40 nm, 35 nm, 25 nm, 20 nm, 14 nm, and 10 nm.
38. The opto-electronic device of claim 33, wherein the first absorption edge wavelength is shorter than the second absorption edge wavelength.
39. The opto-electronic device of claim 33, wherein at least one of the following is true: the first absorption edge is characterized by a first extinction wavelength in a first extinction wavelength spectrum at which an extinction coefficient of the CPL(m)1 equals a threshold value and the second absorption edge is characterized by a second extinction wavelength in a second extinction wavelength spectrum at which an extinction coefficient of the CPL(m)2 equals the threshold value.
40. The opto-electronic device of claim 39, wherein the threshold value is near 0.
41. The opto-electronic device of claim 39, wherein the threshold value is one of at least about: 0.10, 0.09, 0.08, 0.06, 0.05, 0.03, 0.01, 0.005, and 0.001.
42. The opto-electronic device of claim 39, wherein at least one of the following is true: the first extinction wavelength is a longest one of at least one wavelength in the first extinction wavelength

spectrum at which the extinction coefficient of the CPL(m)1 equals the threshold value, and the second extinction wavelength is a longest one of at least one wavelength in the second extinction wavelength spectrum at which the extinction coefficient of the CPL(m)2 equals the threshold value.
43. The opto-electronic device of claim 39, wherein at least one of the following is true: a first derivative of the extinction coefficient of the CPL(m)1 as a function of wavelength is negative at the first extinction wavelength, and a first derivative of the extinction coefficient of the CPL(m)2 as a function of wavelength is negative at the second extinction wavelength.
44. The opto-electronic device of claim 39, wherein at least one of the following is true: the extinction coefficient of the CPL(m)1 at at least one wavelength longer than the first extinction wavelength is no more than the threshold value; and the extinction coefficient of the CPL(m)2 at at least one wavelength longer than the second extinction wavelength is no more than the threshold value.
45. The opto-electronic device of claim 39, wherein at least one of: the extinction coefficient of the CPL(m)1 at a wavelength longer than the first onset wavelength, and the extinction coefficient of the CPL(m)2 at a wavelength longer than the second onset wavelength, is one of no more than about; 0.1, 0.09, 0.08, 0.06, 0.05, 0.03, 0.01, 0.005, and 0.0001.
46. The opto-electronic device of claim 39, wherein at least one of: the extinction coefficient of the CPL(m)1 at a wavelength shorter than the first absorption edge wavelength, and the extinction coefficient of the CPL(m)2 at a wavelength shorter than the second absorption edge wavelength is one of at least about: 0.1, 0.12, 0.13, 0.15, 0.18, 0.2, 0.25, 0.3, 0.5, 0.7, 0.75, 0.8, 0.9, and 1.0.
47. The opto-electronic device of claim 39, wherein the extinction coefficient of the CPL(m)2 exceeds the extinction coefficient of the CPL(m)1 for at least one wavelength in the first wavelength spectrum.
48. The opto-electronic device of claim 39, wherein the extinction coefficient of the CPL(m)2 exceeds the extinction coefficient of the CPL(m)1 for every wavelength in the first wavelength spectrum.
49. The opto-electronic device of claim 39, wherein the extinction coefficient of the CPL(m)1 at any wavelength is no more than the threshold value at the second onset wavelength.
50. The opto-electronic device of claim 39, wherein the extinction coefficient of the CPL(m)1 is no more than the threshold value at all wavelengths in the second wavelength spectrum.
51. The opto-electronic device of claim 39, wherein the extinction coefficient of the CPL(m)1 at any wavelength in the second wavelength spectrum is one of no more than about: 0.1, 0.09, 0.08, 0.06, 0.05, 0.03, 0.01, 0.005, and 0.0001.
52. The opto-electronic device of claim 2, wherein at least one of: the first CPL, and the second CPL, acts as a patterning coating having an initial sticking coefficient of a conductive coating material for an exposed layer surface thereof that is low relative to the initial sticking coefficient for an exposed layer surface of an underlying surface on which the patterning coating has been deposited.
53. The opto-electronic device of claim 2, wherein the first CPL material has a different composition from the second CPL material.
54. The opto-electronic device of claim 2, further comprising at least one electrode coating in the first emissive region and the second emissive region.
55. The opto-electronic device of claim 54, wherein the first CPL is disposed on an exposed layer surface of the at least one electrode coating.
56. The opto-electronic device of claim 55, wherein the at least one electrode coating comprises a metallic coating and a conductive coating disposed on an exposed layer surface of the metallic coating.
57. The opto-electronic device of claim 56, further comprising at least one semiconducting layer, wherein the at least one electrode coating lies between the at least one semiconducting layer and

the first CPL in the first emissive region, and between the at least one semiconducting layer and the second CPL in the second emissive region.