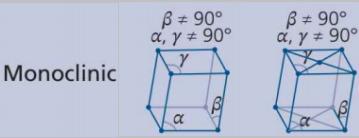


Corrections and Additions for the 2nd Impression

Date: 3.5.2024

Author/Title: Forrest: Organic Electronics

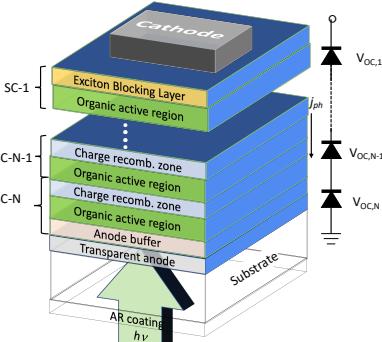
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	Page number	Line number	Incorrect content	Correction/instructions on how to correct
1	33	Table 2.1	Monoclinic 	Change labels above both rectangles to " $\alpha, \gamma = 90^\circ$ "
2	35	Column 2, 1 st paragraph, last line	" $\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c})$ "	" $\bar{\mathbf{a}} \cdot (\bar{\mathbf{b}} \times \bar{\mathbf{c}})$ "
3	42	Fig. 2.9, vertical axis label	"Energy/ hcR "	"Energy/ hcR_∞ "
4	43	Column 2, 2 nd line from bottom.	" $-\Delta\Phi(\mathbf{r})$ "	" $-\nabla\Phi(\mathbf{r})$ "
5	45	Column 1, 1 st full para., line 7	"a full electron charge"	"0.1 q "
6	76	Figure 3.1 B	Diagram at far right shows "S=0"	Change to "S=1"
7	79	Column 2, Eq. 3.18	" m_e "	" m_N "
8	82	Column 2, line 3	"3.46"	"3.26"

9	105	Col. 1, starting 2 lines above Eq. 3.98	"will decrease to $I(d)$ after travelling a distance, x (cf Eq. 3.94): $I(d) = I(0)e^{-\alpha(v)x}$,"	"will decrease to $I(x)$ after travelling a distance, x (cf Eq. 3.94): $I(x) = I(0)e^{-\alpha(v)x}$ "
10	156	Col. 2, Eq. 3.255	$\frac{L_D}{\tau_r} \frac{\partial^2 n(x)}{\partial x^2} - \frac{n(x)}{\tau_r} + \frac{I_0 \alpha(\lambda)}{\cos \theta} \exp\left(-\frac{\alpha(\lambda)x}{\cos \theta}\right) = 0$	$\frac{L_D}{\tau_D} \frac{\partial^2 n(x)}{\partial x^2} - \frac{n(x)}{\tau_D} + \frac{I_0 \alpha(\lambda)}{\cos \theta} \exp\left(-\frac{\alpha(\lambda)x}{\cos \theta}\right) = 0$
11	198	In the line following Eq. 105		Insert "where C is a density-dependent fitting parameter".
12	218	Col. 2, paragraph 1, line 2	"Fig. 4.59a"	"Fig. 4.58a"
13	225	Eq. 4.175	There are two instances where A' is found.	Replace with A (i.e remove ')
14	249	Col. 1, first line after Eq. 4.277	" $W = x_n + x_p$ "	" $W = x_p - x_n$ "
15	256	Col. 2, line 1	"Fig. 4.103"	"Fig. 4.101"
16	282	Prob. 3(a), line 2	$\langle \epsilon_\infty \rangle = -\frac{\sigma^2}{k_B T}$	Delete this expression
17	297	Col. 2, para. 3, line 1-2	"located at unoccupied"	"located between occupied"
18	301	Col. 1, line 9	"Problem 4.1"	"Problem 5.1"
19	324, 325	Col. 2, 4 th line from bottom, Col. 1, Eq. 5.20, Col. 1, Eq. 5.21	" T_{source} "	" T_{cell} "
20	326	Col. 1, line immediately following Eq. 5.28	"The net rate of...."	"Here, D_{org} is the diffusion constant of the molecules in the gas (i.e. from Fick's Law, the organic molecular current across the boundary layer is $j_{org} = D_{org} c_{org} / \delta$ for a concentration of c_{org}). The net rate of...."

21	375	Col. 2, 2 nd line from bottom	"LUMO of the HBL is too low to block electrons"	"LUMO energy of the HBL is too small"
22	376	Col. 1, line 1	"HTL"	"HBL"
23	377	Figure. 6.8	x-axis labels missing	<p>Please fix as shown</p>
24	378	Col. 2, 3 rd paragraph, line 7	"particular spectrum, photo-"	"particular spectrum, radio-"
25	386	Col. 2, 2 nd full paragraph, line 3	"Fig. 6.20a"	"Fig. 6.22a"
26	473	Col. 1, 2 nd line from bottom	"Fig. 6.128"	"Fig. 6.124"
27	476	Col. 2, line 1	"lifetime"	"decay rate"
28	476	Col. 2, Eq. 6.111	$F \frac{\tau}{\tau_0}$	$PF \frac{\tau}{\tau_0}$
29	503	Eq. 6.122	$LTx(L_0) = LTx(L_{0lst}) \cdot \left[\frac{L_0}{L_{0lst}} \right]^n$	$LTx(L_0) = LTx(L_{0lst}) \cdot \left[\frac{L_{0lst}}{L_0} \right]^n$

30	504	Col. 1 paragraph 1 to Col. 2 paragraph 1.	Delete text starting with "Increasing the operating temperature..." to "thus yields the stretched exponential behavior of the luminance"	<p>Insert: "Increasing the operating temperature can also accelerate aging. We assume that the probability for destroying an emitting molecule is thermally activated, i.e. the probability is:</p> $P = \exp(-\Delta E_A / k_B T)$ <p>where ΔE_A is the activation energy for the formation of non-radiative molecular species. Now the rate of defect formation can be obtained by solving:</p> $\frac{dQ}{dt} = -(Q - N_0)/\tau \quad (6.123)$ <p>Where Q is the defect density, N_0 is the total number of emitting molecules at $t = 0$, and τ is the time for defect formation, as defined in Eq. 6.121. Solving Eq. 6.123 yields an exponential decrease in increase in defect density with time: $Q(t) = N_0(1 - \exp(-t/\tau))$, which is consistent with $Q(0) = 0$ and $Q(\infty) = N_0$, i.e. all the emitting centers are eventually eliminated as defects. Now, as above, we assume that the defect formation rate is thermally activated such that:</p> $\frac{1}{\tau} = k_0 \exp(-\Delta E_A / k_B T) \quad (6.124)$ <p>Equations 6.121 and 124 suggest that increasing T will accelerate the degradation in luminance, $L(t)$. Then, combining 6.122 and 6.124 we arrive at a luminance lifetime at standard operating initial luminance and operating temperature, T_0, that can be related to accelerated by elevated test temperature, T_{tst}, and initial luminance, L_{0tst}:</p> $L_{Tx}(L_0, T_0) = L_{Tx}(L_{tst}, T_{tst}) \left[\frac{L_{0tst}}{L_0} \right]^n \exp \left(-\frac{\Delta E_A}{k_B} \left(\frac{1}{T_{tst}} - \frac{1}{T_0} \right) \right). \quad (6.125)$ <p>This methodology is valid only if the test conditions allow for independent determination of lifetime due to temperature and luminance. Also, the temperature and initial luminance used in the accelerated aging tests must be kept sufficiently low so as not to introduce degradation processes that differ from those experienced under normal operating conditions. Note that a similar analysis also applies to organic detectors (see Sec. 7.8)."</p>
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31	552	Col. 2, line 2	"emitting OLED, along"	"emitting OLED on a glass substrate, along"
32	552	Fig. P6.4	Right axis label "cd/cm ² "	Change to "cd/m ² "
33	559	Col. 2, Ref. 10 from top	"Kanno, H., Sun, Y. & Forrest, S. R. 2006b"	"Kanno, H., Giebink, N. C., Sun, Y. & Forrest, S. R. 2006b"
34	570	Column 2, line 7 after Eq. 7.3	"equal to the total number of photons incident to the electrons generated"	"equal to the ratio of the total number of electrons generated to the photons incident"
35	573	Col. 2 line just prior to Eq. 7.24	"Eq. 7.3"	"Eq. 7.14"
36	573	Co. 2 line 5 following Eq. 7.24	"that reach the active"	"that generate charge in the active"
37	577	Col. 2, Eq. 7.48	" $\eta_{ext} = \eta_A \eta_{int} =$ "	" $\eta_{int} =$ "
38	586	Col. 2, line 1	" , or less than"	Delete text
39	587	Col. 2, Eq. 7.65		Replace Eq. 7.65 with " $\Delta f = \frac{1}{2\pi} \left(\frac{1}{\tau_{ED} + t_{tr} + \tau_{RC}} \right)$ "
40	580	Fig. 7.9	One too many charge recomb. zones in the figure	Replace figure with the one attached  A 3D schematic diagram of an organic light-emitting diode (OLED) stack. The stack consists of a cathode at the top, followed by an exciton blocking layer and an organic active region. Below these are multiple layers labeled SC-1, SC-N-1, and SC-N, each containing a 'Charge recomb. zone' and an 'Organic active region'. The stack continues down through an 'Anode buffer' and a 'Transparent anode' to a 'Substrate' at the bottom. An 'AR coating' is shown at the very bottom. Light is emitted from the AR coating, indicated by a green arrow labeled 'hv'. External voltage sources are connected to the top cathode and the bottom transparent anode, with voltages labeled V _{OC,1} , V _{OC,N-1} , and V _{OC,N} . A current arrow labeled j _{ph} points upwards through the stack.
41	580	Col. 1, para. 1, line 9	"is similar to"	"differs from"

42	608	Col. 1, line 1-2	Delete: "All device responses are limited by the hole transit time across the donor layers"	Insert: "While the frequency response of these devices is attributed to the limited hole mobilities in the donors, it may also be due, in part, to slow exciton diffusion to the HJ from their point of generation in the donor and acceptor layers."
43	635	Col. 1, line 3	" η_{EL} "	" η_{CT} "
44	635	Col. 1, Eq. 7.153a	$\Delta V_{OC}^{nr} = V_{OC}^{rad} - V_{OC} = m \left(\frac{k_B T}{q} \right) \log(\eta_{CT})$	$\Delta V_{OC}^{nr} = V_{OC}^{rad} - V_{OC} = -m \left(\frac{k_B T}{q} \right) \log(\eta_{CT})$
45	635	Col. 1, Eq. 7.153a	$\Delta V_{OC}^{nr} = m \left(\frac{k_B T}{q} \right) \log \left(\frac{\eta_{EL}}{\gamma \chi_{em}} \right)$	$\Delta V_{OC}^{nr} = -m \left(\frac{k_B T}{q} \right) \log \left(\frac{\eta_{EL}}{\gamma \chi_{em}} \right)$
46	699	Col. 1, Caption Fig. 7.158		At the end of the caption, insert: "Donors have a similar structure but with d and a moieties switched."
47	730	Col. 1, para. 1, lines 2-13	"When an electron from an adjacent acceptor layer is at distance r from a neutral Ag NP metal sphere, it is attracted by its mirror image with a force of $q^2/(4\pi\epsilon_r\epsilon_0 r^2)$. Once the electron binds to the sphere, the NP is negatively charged, and subsequently attracts a hole from the adjacent donor layer with the same force. The electron and hole recombine, and the process begins once more starting with the neutral NP. The binding energy of an electron to the NP is $E_B = q^2/(8\pi\epsilon_r\epsilon_0 r)$. At room temperature, and at a distance, $r = 4$ nm, $E_B = 2.4k_B T$."	When an electron from an adjacent acceptor layer is at distance $r \gg R$ from a neutral Ag NP metal sphere of radius R , it is attracted by its mirror image with a force of $-\frac{q^2}{4\pi\epsilon_0\epsilon_r} \frac{R}{r^3}$. Once the electron binds to the sphere, the NP is negatively charged, and subsequently attracts a hole from the adjacent donor layer with the same force. The electron and hole recombine, and the process begins once more starting with the neutral NP. The attractive energy of an electron to the NP is $E_B = -\frac{q^2}{8\pi\epsilon_0\epsilon_r} \frac{R}{(r^2-R^2)}$. At room temperature, a charge at a distance, $r = 4$ nm, for a sphere of radius 2 nm, $E_B \approx -1.5k_B T$.
48	777	Col. 2, Eq. 7.220 + following 2 lines	" $\Delta P_{loss} = I^2 R_{ser}$ (7.220) Thus, series-connected cells in modules are preferred over parallel-connected cells to minimize losses"	" $\Delta P_{loss} = I^2 R_{ser} = V^2/R_{ser}$ (7.220) Thus, series-connected cells in modules are preferred over parallel-connected cells to minimize current losses"
49	786	Prob. 9(c), line 2	"at SRC"	delete
50	811	Eq. 8.1	" qV_{bi} "	" V_{bi} "

51	816	Col. 1, para. 2, line 3	“intercept at $V_{GS} = 0$ ”	“intercept at $g_D = 0$ ”
52	818	Col. 1, line 3	“there is no current saturation regime. The”	“the”
53	840	Fig. 8.53b	“0.0” on x-axis	Change to “1”
54	840	Fig. 8.53c	Right axis, second number from top is “ 10^{-8} ”	Change to “ 10^{-7} ”
55	845	Col. 1, line 2 after Eq. 8.65	“charge concentration $\Delta Q = \Delta n_s$.”	“charge concentration $\Delta Q = q\Delta n_s$.”
56	846	Col. 1, para. 2, line 3 after Eq. 8.73	“ k_D is the lifetime”	“ $1/k_D$ is the lifetime”
57	859	Fig. 8.77, compound 12	Incorrect molecular formula	Replace with: 