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Course Project Report

MINI-PROJECT

ADVANCED ELECTRONICS 18AEL23

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INTRODUCTION

Light detection represents one of the fundamental pillars of modern technology as it enables a variety of everyday applications in optical communications, medical diagnostics and imaging systems. In order to match the required benchmarks of these technologies, the detector characteristics need to be tailored to the final application in terms of optoelectronic performance and device design. This is particularly relevant to upcoming technologies such as visible light communication (VLC) which aims to provide indoor navigation in buildings, direct and secure optical data links as well as high-speed communication by using ambient lighting to transmit data. In the scope of multichannel communication, high requirements in terms of spectral selectivity should be met in addition to a fabrication route compatible with future mobile and wearable devices based on lightweight and flexible electronics. As such, these devices have relied on device engineering approaches to limit their spectral responsivity range.

Recently, solution-processed wavelength selective OPDs have been realized by means of:

i) optical filtering

ii) charge collection narrowing

iii) cavity enhanced absorption.

All of these techniques have demonstrated wavelength selective responsivity and enabled successful application in color reconstruction or IR-spectroscopy. However, all three approaches present challenges that limit their technological transfer toward industrially relevant printing techniques. These challenges include:

i) additional layers and processing steps.

ii) time investment in ink formulation for different active layers.

iii) high optical quality demands regarding layer homogeneity and thickness.

Color sensor and color correction

Color sensor

Color has always played an important role in our life and production activities. The color of an object contains a lot of information, so it is easily affected by many factors, such as radiation light and reflections, light source azimuth, observation orientation, and the performance of the sensor the change of any parameter will lead to a change in the observed color.

The standard method of color measurement is that measures the sample tristimulus values by making use of spectrophotometric color measurement instrument and obtains the color of the sample. At present, there are two basic types sensor based on the principle of all kinds of color identification:

- RGB color sensor (red, green, blue) mainly detects tristimulus values.
- Chromatic aberration sensor detects the chromatic aberration of the object to be tested and the standard color. This kind of device contains diffuse type, beam type, and optical fiber type, and is encapsulated in various metals and polycarbonate shells.

DEMO-VIDEO

The video has the results, observation, working and circuit diagram of the project.

FUTURE SCOPE

Major growth in the color sensor market is largely as a result of the expansion of digital imaging into cameras, whether stand-alone or integrated within smart cellular phones or automotive vehicles. Applications in biomedicine, education, environmental monitoring, optical communications, pharmaceutics and machine vision are also driving the development of imaging technologies. Organic photodiodes (OPDs) are now being investigated for existing imaging technologies, as their properties make them interesting candidates for these applications. OPDs offer cheaper processing methods, devices that are light, flexible and compatible with large (or small) areas, and the ability to tune the photophysical and optoelectronic properties − both at a material and device level. Although the concept of OPDs has been around for some time, it is only relatively recently that significant progress has been made, with their performance now reaching the point that they are beginning to rival their inorganic counterparts in a number of performance criteria including the linear dynamic range, detectivity, and color selectivity. This review covers the progress made in the OPD field, describing their development as well as the challenges and opportunities.

Future lightweight, flexible, and wearable electronics will employ visible-light-communication schemes to interact within indoor environments. Organic photodiodes are particularly well suited for such technologies as they enable chemically tailored optoelectronic performance and fabrication by printing techniques on thin and flexible substrates.

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