PRESS RELEASE

Fraunhofer IIS develops integrated, low-cost color sensor for controlling LED lighting

**Researchers at the Fraunhofer Institute for Integrated Circuits IIS in Erlangen, Germany have developed a color sensor with an integrated on-chip filter for controlling color and brightness fluctuations that can occur with LEDs. Nano-structured metal layers for spectral filtering, combined with an underlying layer of photodiodes, can be utilized in a feedback loop to control colors, thus enabling defined color perception. The low-cost CMOS (complementary metal oxide semiconductor) process used to manufacture the color and multispectral sensors promises broad utility. Researchers will be presenting a prototype at the SENSOR + TEST trade fair in Nürnberg from June 3 to 5, 2014 (hall 12, exhibit booth 12-537).**

Although they revolutionized the lighting industry, LEDs remain susceptible to problems since their center wavelength can be impacted by temperature and aging effects. For this reason, luminance diminishes with longer use, changes in ambient temperature can cause color variations or brightness disparities can become too obvious after swapping out lamps. In many applications such as in operating rooms, film production and vehicle lighting systems, reliable and stable lighting is vital or at least desired. With this in mind, Fraunhofer IIS researchers have developed an integrated sensor designed to control LED colors and intensity.
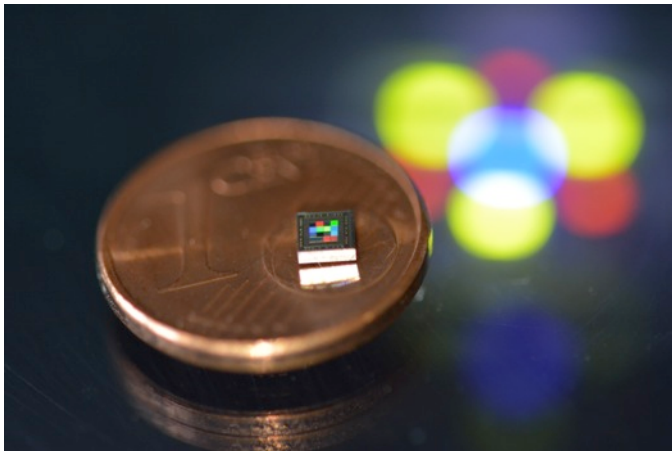
CMOS color sensor with integrated nano-structures. © Fraunhofer IIS | Image available in color and print quality: www.iis.fraunhofer.de/pr

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FRAUNHOFER INSTITUTE FOR INTEGRATED CIRCUITS IIS

When manufacturing color and multispectral sensors, the color filters have to be fabricated using additional post-processing steps. Experts at Fraunhofer IIS have now discovered a method for manufacturing on-chip filters. In this case the color filter is integrated in the sensor. "That allows us to integrate production directly into the CMOS process," explains Fraunhofer IIS project manager Dr. Stephan Junger who adds: "This is one of the most cost-effective and highly-integrated solutions available. We anticipate our technology will enjoy wide acceptance in the LED industry as a result." Nano-structured plasmonic filters in the metal layers of the semiconductor process are utilized as spectrally selective elements. When combined with photodiodes, this opens the door to high-volume manufacturing of the integrated sensors. The sensors can serve as the basis for the cost-effective development of color control systems used in high-quality LED-based lighting systems.

Metal layer
Dielectric
Photo diode
Substrate
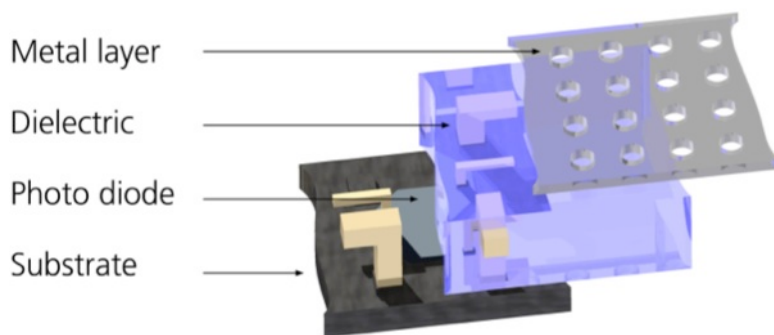
CMOS photodiode with nano-structured top layer. © Fraunhofer IIS | Image available in color and print quality: www.iis.fraunhofer.de/en/pr.

Fraunhofer IIS researchers are presenting a prototype of the color sensor at the SENSOR + TEST trade fair in Nürnberg from June 3 to 5, 2014 (hall 12, exhibit booth 12-537).

The **Fraunhofer-Gesellschaft** is the leading organization for applied research in Europe. Its research activities are conducted by 67 institutes and research units at locations throughout Germany. The Fraunhofer-Gesellschaft employs a staff of more than 23,000, who work with an annual research budget totaling 2 billion euros.

Founded in 1985, **Fraunhofer Institute for Integrated Circuits IIS** in Erlangen, Germany, ranks first among the Fraunhofer Institutes concerning headcount and revenues. As the main inventor of mp3 and universally credited with the co-development of AAC audio coding standard, Fraunhofer IIS has reached worldwide recognition. In close cooperation with partners and clients the Institute provides research and development services in the following areas: Audio & Multimedia, Communications Systems, Energy Management, IC Design and Design Automation, Imaging System, Medical Technology, Non-destructive Testing, Positioning, Safety and Security Technology, Sensor Systems plus Supply Chain Management.

More than 830 employees conduct contract research for industry, the service sector and public authorities. Fraunhofer IIS with its headquarters in Erlangen, Germany, has further branches in Nuremberg, Fuerth, Wuerzburg, Ilmenau, Dresden, Bamberg, Deggendorf und Coburg. The budget of 108 million euros is mainly financed by projects. Less than 25 percent of the budget is subsidized by federal and state funds.

Detailed information on www.iis.fraunhofer.de.