

Press Release SID Display Week 2013
21st – 23rd May 2013, Vancouver/Canada
Booth No. 1209 (German Pavilion)

Color-filter-less full-color OLED microdisplays

Fraunhofer COMEDD and VON ARDENNE present this novel technology at SID Display Week 2013 for the first time

For several years Fraunhofer COMEDD has been working on the integration of organic light emitting diodes (OLED) into silicon. OLED-on-silicon technology enables e.g. the fabrication of miniaturized displays, so called OLED microdisplays. Furthermore also miniaturized electro-optical sensors like e.g. light barriers or optocoupler could be manufactured by using this technology.

OLED microdisplays are used for example in data eyeglasses for the presentation of virtual or augmented information. Moreover OLED microdisplays are also applied in view finders of digital cameras. Depending on the application monochrome or colored microdisplays are needed. As of today the lower limit for patterning organic layers is at pixel pitch about 50 μm using conventional technologies – thus infeasible to apply for OLED microdisplays with smaller pixel pitches of approximately 8 μm or below. For those OLED microdisplays all sub-pixels are coated with a white OLED and a color filter is arranged in front. This filter is able to separate red, green and blue sub-pixels. The disadvantage is, that the color filter causes enormous losses in the light brightness and brilliance. The reason is, that approximately 2/3 of the spectral range of the white pixels are always cut off for the colors that are not needed, and white OLED is itself less efficient than monochrome, therefore just 10 to 20 % of the emitted light could be used.

Together with VON ARDENNE Anlagentechnik GmbH Fraunhofer COMEDD introduces a technology, that enables to pattern OLED microdisplays on sub-pixel level. Therefore VON ARDENNE has developed a flash-mask-transfer-lithography (FMTL), which has been applied for Fraunhofer COMEDD's microdisplays.

Dr. Rigo Herold, project manager at Fraunhofer COMEDD explains: "Especially for mobile applications like data eyeglasses or camera view finders high luminance and low power consumption are needed. The conventional approach based on white OLED and color filters has its limits because the high luminance causes significant decrease of the operating lifetime. By introducing FMTL to OLED microdisplays we now can eliminate this disadvantage."

Dr. Uwe Vogel, Manager of COMEDD's Business Unit OLED Microdisplays & Sensors adds: "There is a general trend in OLED displays to achieve true color-by-monoRGB, based on various technology approaches. That trend gets more demanding at upcoming pixel densities in high-definition mobile (small/medium size) displays. OLED micro-displays exhibit the ultimate pixel density/resolution and patterning feature size specification. We are pleased to have partnered with VON ARDENNE Anlagentechnik GmbH to implement FMTL in color-filter less OLED microdisplays with potentially improved efficiency, brightness, lifetime and color gamut."

The FMTL-technology works with special transfer masks. Organic layers are locally deposited through the masks via thermal heat input and transferred to the microdisplay. Thus sub-pixels with a size smaller than 10 µm x 10 µm can be coated. Therefore adjacent red, green and blue monochrome sub-pixels on microdisplays can be manufactured, the color-filter replaced completely, eventually the efficiency increases significantly.

At the SID 2013 Dr. Rigo Herold will give two presentations on this topic at the Exhibitor Forum (May 22, 2013, 2.30 pm, hall B) and on the symposium, session 27: OLED Displays 1 (Tuesday, May 22, 2013, 10.40 am – 12.00 am, Ballroom B).

About Fraunhofer COMEDD:

Fraunhofer COMEDD was founded as an independent research institution of the Fraunhofer-Gesellschaft in order to transfer the results of research and development in the field of organic materials and systems to production. The institution combines research and development works for the production, integration and technology of organic electronic devices. The focus of Fraunhofer COMEDD lies in customer- and application orientated research, development and pilot fabrication of novel module concepts and fabrication methods for these organic electronic devices. Fraunhofer COMEDD is an European-wide leading production-related research and development center for organic semiconductors focusing on organic light-emitting diodes and vacuum technology.

The Fraunhofer COMEDD clean room consists of the following equipment:

- a pilot line for the fabrication of OLEDs on 370 x 470 mm² substrates,
- two pilot lines for 200 mm wafer for the OLED integration on silicon substrates as well as
- a research line for the roll-to-roll fabrication on flexible substrates.

Fraunhofer COMEDD offers a wide range of research, development and pilot production possibilities, especially for OLED lighting, organic solar cells and OLED microdisplays.

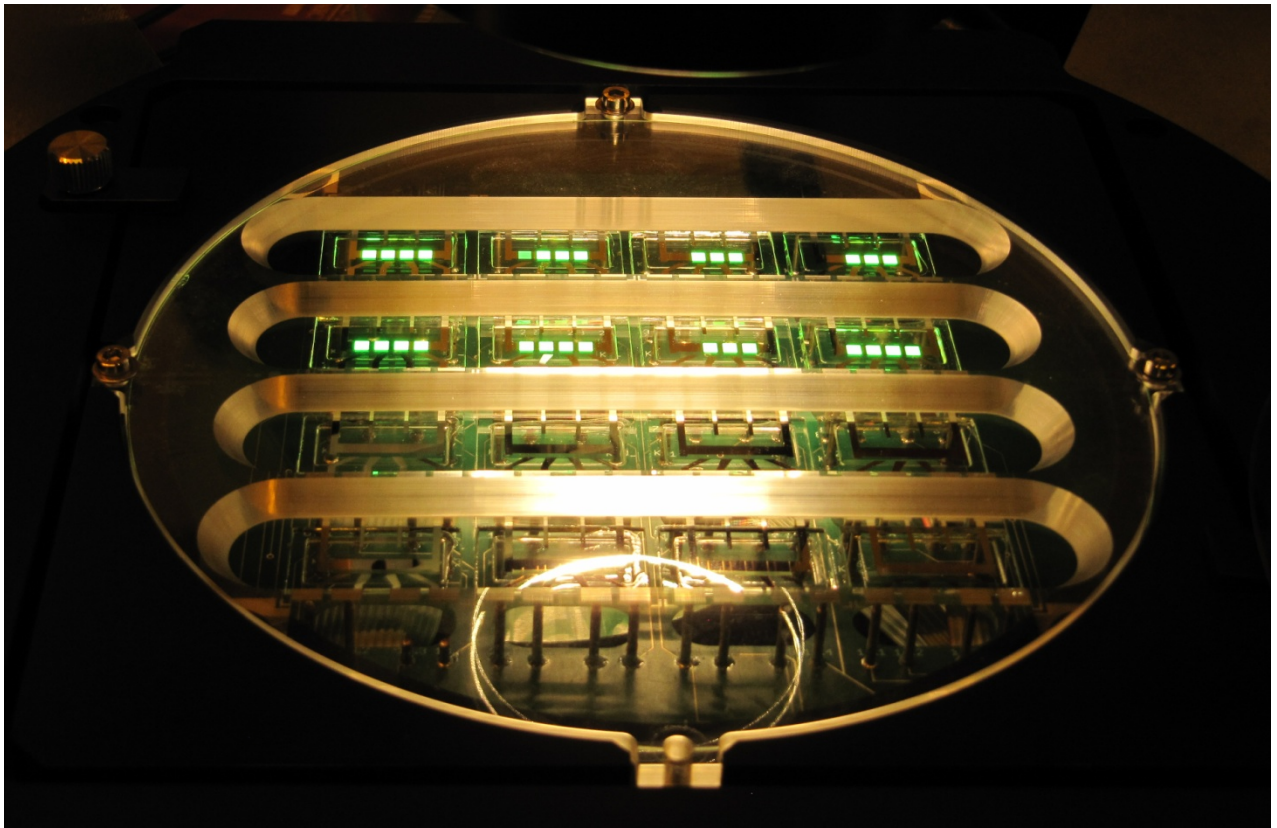
About VON ARDENNE Anlagentechnik GmbH:

VON ARDENNE is a worldwide leading manufacturer of advanced coating equipment to deposit micrometer and nanometer thin functional layers on materials such as glass, metal strip and polymer films. The expertise in plasma and electron beam technologies built over decades, in-depth R&D and the innovative strength that is closely related to the name VON ARDENNE, enable high-quality solutions. Given the diversity and extremely fast changes of methods and technologies in our markets, we count on synergy effects of our own development projects and research cooperation with various institutions.

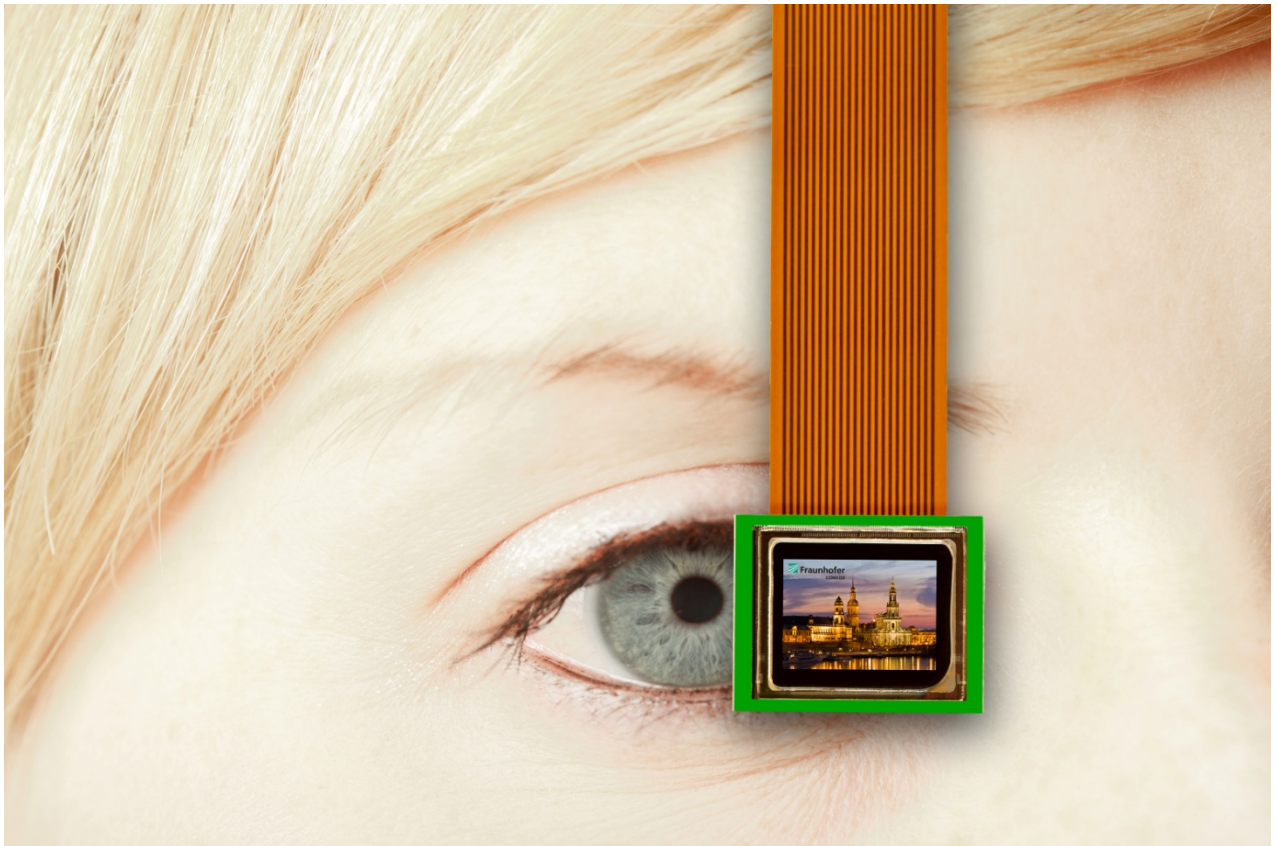
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OLED structured with FMTL-technology



Bidirectional OLED microdisplay