SCOOP Project

OLED Microdisplay with Enhanced Brightness and Colour Performance for Imaging and Augmented Reality Applications

SCOOP is a European funded project (FP7 project number 287595 – SCOOP). It is focused on OLED technology, microdisplays based on the combination of OLED with CMOS technology, and innovative visualization systems. OLED microdisplays are based on "Above-IC" integration with the principal value chain being located in Europe. SCOOP intends to improve the competitiveness of European industry by helping the industrial partners to maintain and improve their technological advance and to extend their market share by enabling new products. The project will also contribute to strengthen Europe's scientific and technology base in the field of OLED and thin film encapsulation, which can be leveraged for a variety of applications through the institutional partners and the material supplier involved in the project. The project will also provide system integrators with components with outstanding features enabling innovative products like informative eyewear or augmented reality glasses.

The main S &T objectives of SCOOP are:

- **To provide OLED stacks with improved reliability** in order to widen the field of application of OLEDs for displays and lighting in general, in particular
  - Increased operation and storage temperature range
  - High luminance operation
  - >10000hrs of lifetime as well as reduced luminance decay over time (marking)

- **To provide improved thin film encapsulation** for better environmental resistance, in order to widen the field of application for OLEDs for outdoor, defence and automotive applications, in particular:
  - Compatibility with high operation and storage temperature range (up to 105°C)
  - Enhance robustness of the OLED deposition process against defect density

- **To develop a new OLED device concept** which will enable high luminance full colour microdisplays, simplify the manufacturing process, and improve manufacturing yield by integrating solution processed, photo-patternable hole transport layers (xHTL) developed by UCO into the OLED. In particular, with this approach we expect
  - To be able to tune the colour spectrum of emission on subpixel level
  - Enable high brightness levels, on pixel level up to 5000cd/m² by eliminating the use of colour filters
  - Reduce the defect density, in particular due to imperfect substrate topography
  - Simplify the manufacturing process by eliminating the colour filter deposition and alignment

- **To test and qualify the new OLED stacks** and the encapsulation stack in high image quality emissive microdisplays as a pilot application

- **To make the demonstration of new emissive microdisplays in innovative visualisation systems**, in particular head mounted displays with optical see-trough function for augmented reality and outdoor applications

The partners cover the whole value chain, from research, materials and components to systems. All industrial partners have their main manufacturing sites located in Europe. The outcomes of the project are not limited to microdisplay applications but can apply to many OLAE devices like biosensors, small to large size direct view displays, lighting devices, or solar cells.

In this way, the project is intended to improve the competitiveness of the European industry by helping the industrial partners MICROOLED (www.microoled.net) and Merck (www.merck-chemicals.com/lcd-emerging-technologies/oled-materials) to considerably extend their market share in this field and to improve the technological advance in the field of OLED in general. The project will also contribute to strengthen Europe's scientific and technology base in the field of OLED and thin film encapsulation, knowledge that can be easily leveraged for other applications through the institutional partners LETI (www.leti.fr/en) and the University of Cologne (www.meerholz.uni-koeln.de), or through Merck as a material supplier. Moreover, the project will provide European system integrators, namely Yukon Optics (www.yukonopticsglobal.com) and Optinvent (www.optinvent.com) with OLED microdisplay components with outstanding features that will enable new and innovative products like informative eyewear and augmented reality (see-through) glasses.

In a more general manner, these new products respond to different societal challenges: In the longer term, augmented reality glasses will be used as vision aids for visually impaired people, a phenomenon touching an increasing percentage of the population mainly due to the ageing population. Video glasses and viewfinders are also very low power consumption device, e.g. video glasses consumes typically several hundred times less compared to a monitor with equivalent image size and resolution. For some specific applications, video glasses can substitute one or more monitors and present other distinctive advantages like hand-free operation, or 3D rendering, as e.g. for surgical applications, entertainment (video, gaming), or in logistics and maintenance. Microdisplay based visualisation systems are also getting more and more used for security related applications like firemen helmets, night and infrared vision devices etc.

The market for microdisplays is currently undergoing rapid growth through new applications like HMD, a market that is now boosted by new 3D applications, new concepts like informative eyewear, the replacement of optical viewfinders by electronic viewfinders in high end digital cameras, as well as a broad range of high value professional applications like digital night vision, medical applications like vision aids, or industrial applications e.g. in logistics and maintenance. According to a study of McLaughlin Consulting Group, the total market for microdisplays will be around 500M$ in 2012 with average growth rate of more than 100% per year.