



Cambrios Partners with Novaled to Produce 100 sqcm OLED Lighting Tile with New Highly Transparent Electrodes

Partnership Enables Innovative OLED Tile Design and Shapes the Future of OLED Lighting Technology

SUNNYVALE, Calif., DRESDEN, Germany, April 15, 2013 – [Cambrios Technologies Corporation](#), the leader in nanotechnology-based solutions for the transparent and flexible conductor markets, and [Novaled](#), a leader in the research, development and commercialization of technologies and materials that enhance the performance of OLEDs (Organic Light Emitting Diode) and Organic Solar Cells, announced today the successful creation of a metal grid free large area 100 cm² (10 cm by 10 cm) OLED lighting tile, using Cambrios ClearOhm™ transparent electrodes. This breakthrough development is the result of a collaboration by Cambrios and Novaled to demonstrate the functionality of a high performance large area OLED tile enabled by Cambrios' silver nanowire material.

Commercially available OLED lighting tiles currently utilize indium tin oxide (ITO) transparent electrodes. However, due to the limited conductivity of ITO (20 ohms/sq on glass and 50-100 ohms/sq on flexible plastic film), the voltage drops considerably over lengths larger than 2 centimeters, requiring the application of metal grids on top of the ITO to prevent any gradients in light emission caused by the voltage drop. Cambrios ClearOhm coatings can have a resistance as low as 5 ohms/sq with greater than 90 percent transmission independent on the carrier substrate, enabling large 100 cm² tiles with uniform light emission. In addition the ClearOhm™ electrodes offer significant potential for cost reductions in comparison to ITO and are ideally suited for all sorts of flexible device applications.

“Partnering with Novaled to create a large OLED lighting tile symbolizes Cambrios' commitment to help drive the manufacturability of the emerging OLED industries,” said Cambrios' Senior Director of Business Development, Dr. Rahul Gupta. “The partnership underscores the continued expansion of our supply chain of strategic relationships in the OLED and OPV industries in addition to our existing strong ecosystem of IC suppliers, sensor makers and film suppliers that serve the large area touch market.”

Cambrios has already demonstrated a 5 cm by 5 cm OLED lighting tile with efficiencies greater than 40 lm/W, based on ClearOhm electrodes. OLEDs made using Cambrios ClearOhm electrodes exhibit improved angle dependence of color, providing higher quality OLED displays and lighting products. The ClearOhm-based 10 cm by 10cm tile proves ClearOhm transparent coating material can create high performance OLED Lighting panels at commercially viable sizes.

“We chose to partner with Cambrios because of their coating materials excellent performance. Novaled's materials and technology in combination with Cambrios' ClearOhm coating materials as a transparent electrode led to high performance hybrid OLEDs”, said Dr. Sven Murano, Novaled's VP of Product Management. “With this approach manufacturers can produce high-performance, long lifetime OLED lighting tiles in high volumes at affordable costs.”

Cambrios ClearOhm coating material creates highly conductive and transparent electrodes that enable large area OLED lighting tiles. Several commercial products already use ClearOhm coating material, which can form transparent conducting layers on a variety of substrates and at a wide range of sheet resistances to enable an array of applications including touch screens, liquid crystal displays, OLED devices, and thin film photovoltaics.

About Novaled:

Novaled AG is a leader in the research, development and commercialization of technologies and materials that enhance the performance of OLEDs (organic light-emitting diodes) and other organic electronics. Novaled offers OLED product manufacturers a unique combination of proprietary technology, materials and expertise, and is currently the only company licensing and selling organic conductivity doping technology and materials for use in the



commercial mass production of display products in the OLED industry. Novaled has developed strategic partnerships with key OLED innovators and producers throughout the world and, with a broad portfolio of more than 500 patents granted or pending, has a strong IP position in OLED technologies, structures and materials. Commercially active since 2003, Novaled was founded in 2001 as a spin-off of the Technical University and the Fraunhofer Institute of Dresden. Novaled is headquartered in Dresden with sales offices in Korea and Japan. www.novaled.com

About Cambrios:

Cambrios leads the industry in providing solutions based on proprietary, innovative technologies for consumer electronics markets using nanotechnology. Its breakthrough transparent conductor products, available today, simplify electronics manufacturing processes and improve end-product cost and performance for current and next-generation consumer devices such as large area and flexible touch and other high conductivity, optically clear applications. The company's first product, its ClearOhm™ coating material, produces a transparent, conductive film by wet processing with significantly higher optical and electrical performance than currently used materials such as indium tin oxide. Applications of ClearOhm coating material include transparent electrodes for touch screens, EMI shielding, OLED displays, e-paper, OLED lighting and thin film photovoltaics.

Cambrios is headquartered in Sunnyvale, California with offices in Japan and Taiwan.

About OLEDs

OLEDs (organic light-emitting diodes) are solid-state devices composed of multiple thin layers of organic materials often only a few nanometers thick that emit diffuse light when electricity is applied to them. Because they are an area light source, OLEDs are a key part of fulfilling the dream of the rapidly growing flat panel display market: paper-thin, highly-efficient displays with brilliant colors and excellent design flexibility. OLEDs may also lead to [new lighting products](#) that combine color and shape to create innovative decorative lighting applications and personalized environments. In addition, OLED lighting products have the potential to offer greater cost and energy savings than current lighting technologies.

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ClearOhm™ is a trademark of Cambrios Technologies Corporation.

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