

News Release

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May 30, 2023

Merck KGaA, Darmstadt, Germany's new barrier materials offer superior flexibility, reliability, and longer lifetime in OLED devices

- **New silicon dielectrics processed via low temperature Plasma Enhanced – Atomic Layer Deposition (ALD) technology enables flexible OLEDs in superior display devices**
- **Provides highly improved barrier characteristics: 100 times more effective and 20 times thinner than existing solutions**
- **Wins Display Component of the Year 2023 Award from Society for Information Display (SID)**

Tempe, Arizona, May 30, 2023 – EMD Electronics, the U.S. and Canada Electronics business of Merck KGaA, Darmstadt, Germany, introduced new barrier materials that offer superior flexibility, higher reliability, and longer lifetime in flexible OLED (organic light-emitting diode) devices compared to existing solutions. Last week, the innovative ALD material won the Display Component of The Year 2023 award from SID, the world's biggest display society.

Free-form devices with fully flexible OLED displays are one of the fastest-growing trends in data-driven electronics. Compared with standard displays, these foldable, rollable, stretchable devices require a reduction of about 60% of the display module's thickness. However, OLEDs are highly susceptible to degradation by moisture and oxygen. To prevent damage, an encapsulation or barrier is needed that is conformable, flexible yet durable.

"As a pioneer in display materials, we are committed to providing our customers with solutions that enable new form factors," said Damien Tuleu, Executive Vice President and Head of Display Solutions business unit at the Electronics business sector of Merck KGaA, Darmstadt, Germany. "As the most advanced thin-film deposition technology, our low-temperature ALD silicon materials offer highly improved barrier characteristics - 100 times more effective than current solutions. And they come along with a thinner layer too - 20 times thinner than existing solutions. Ultimately, this means better conformability, flexibility, and durability than ever before."

Flexible OLEDs are critical to enable promising new applications beyond traditional displays such as wearable, rollable displays and biomedical devices. However,



repeated bending and stretching of flexible devices can cause display stress, leading to reduced performance and lifespan. The Electronics business sector of Merck KGaA, Darmstadt, Germany, in collaboration with its partners in the display and equipment industry, addressed this challenge.

Leveraging its 30 years of experience in developing encapsulation materials for the semiconductor industry, the company created new barrier materials which are processed via low-temperature Plasma Enhanced ALD technology for an improved thin film encapsulation. These new materials with improved barrier characteristics enable longer lifetime of the OLED device and fulfill even harsh automotive requirements. The company's low-temperature ALD silicon materials were first introduced in 2022 for automotive OLED and are expected to become an enabling encapsulation technology for upcoming flexible IT OLED displays.

As new form factors enabled by OLED technology continue to penetrate the market, the Electronics business sector of Merck KGaA, Darmstadt, Germany, is well positioned as a leading global material supplier of this technology. With research activities dating back three decades as well as early investments in OLED manufacturing capacities, the company is committed to meet the increasing demand for high-purity OLED materials. This commitment has been strengthened by an investment of around € 30 million, completing projects to expand OLED production capacity in Korea and China in 2022. The company's local OLED production will give its Asia-based customers easier and faster access to OLED materials and a stable and more flexible supply chain.

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The company holds the global rights to the name and trademark "Merck" internationally. The only exceptions are the United States and Canada, where the business sectors of Merck KGaA, Darmstadt, Germany, operate as MilliporeSigma in life science, EMD Serono in healthcare and EMD Electronics in electronics. Since its founding in 1668, scientific exploration and responsible entrepreneurship have been key to the company's technological and scientific advances. To this day, the founding family remains the majority owner of the publicly listed company. For more information about Merck KGaA, Darmstadt, Germany, visit www.emdgroup.com.