

News Release

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Merck KGaA, Darmstadt, Germany Presents New Material Advancements for Next Generation Lithography

- **Merck KGaA, Darmstadt, Germany shows technology leadership in Directed Self Assembly (DSA) and EUV technologies.**
- **Acquisition activities in the past year have broadened the company's product portfolio and brought synergetic options in the Metal Hard Mask Space (MHM).**

Darmstadt, Germany and San Jose, California, USA, February 15, 2016 – Merck KGaA Darmstadt Germany, a leading science and technology company, joins SPIE Advanced Lithography 2016 under its US business EMD Performance Materials after the successful integration of AZ Electronic Materials in May 2014. The annually held conference is taking place at the San Jose Marriott and San Jose Convention Centre in USA from February 21-25, 2016.

This year, Merck KGaA, Darmstadt, Germany is bringing new advancement in materials solutions for next generation lithography, such as Directed Self-assembly (DSA) and Extreme Ultraviolet (EUV) technologies. The company's strong polymer synthesis capability, using anionic polymerization techniques combined with accumulated process and formulation expertise, has led to a leadership position in DSA. This includes formulations with high chi Block Copolymers (BCPs), Patterning Material by Epitaxy (PME) and Neutral Layer for DSA (NLD) materials for Surface Modification for Advanced Resolution Technology (SMART), Liu-Nealey (LiNe) flow and other evolving DSA processes.

In the EUV space, the company's Extreme™ rinse materials tackles the resist collapse issues during the development process by widening the process window



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while reducing overall defect levels. Newly developed materials enable planar surface by using a spin coat process on topographical substrates. These innovative materials address residue issues during etch, as well as critical dimension (CD) control issues using current lithography materials. Merck KGaA, Darmstadt, Germany also offers novel chemical shrink materials for negative tone development (NTD) processing. The NTD shrink material offers tunable CD shrink capability and can be an effective solution to improve pattern roughness and CD uniformity.

Merck KGaA, Darmstadt, Germany aims to become the key solutions provider for semiconductor applications through its many acquisition activities in 2015. This includes acquiring SAFC Hitech, the leading provider of Atomic Layer Deposition (ALD) and Chemical Vapor Deposition (CVD) precursors. SAFC Hitech was the high tech material business of the Sigma Aldrich Group acquired by Merck KGaA, Darmstadt, Germany in end of 2015, and now has become part of the IC Materials Business Unit in the organization. Ormet Circuits Inc., a start-up company with key technologies for lead-free conductive pastes for packaging applications, also joins the company and has added strength to its advanced packaging space.

By leveraging complementary know-how in chemistry and scaling up of metal organics, polymers and other synthesis, Merck KGaA, Darmstadt, Germany is able to offer a broader pipeline and extended R&D capabilities to the customers. One solid example is the innovative spin-on metal oxide hard mask (MHM) platform, which enables superior etch resistance with good filling properties and clean wet or dry etch removal options. In collaboration with the SAFC Hitech Deposition R&D team, Merck KGaA, Darmstadt Germany is exploring the synergistic opportunities and advanced techniques to develop complementary MHM solutions to solve future device node requirements.

“Merck KGaA, Darmstadt, Germany is the leader in the semiconductor materials industry, with 80% of our products achieving either number 1 or 2 position in the market. Now we are building broader solutions and extending our footprint in the IC materials field. Our goal is to provide best in class and tailor-made products to support our customers in developing next generation lithography technology”, states Rico Wiedenbruch, Head of IC Materials BU.

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In addition, the company has been partnering with imec (Interuniversity Microelectronics Center) in the advanced lithography research for many years. In the framework of imec's industrial affiliation program, partners can access the latest materials results and conduct testing in imec's state of the art facilities in Belgium.

SPIE Advanced Lithography 2016, the premier conference for the global lithography community, will be held in San Jose, California, United States, February 21 – 25, 2016. The experts from Merck KGaA, Darmstadt, Germany will be giving technical presentations on DSA materials (9777-15, 9777-24, 9779-37, 9779-49), MHM materials (9779-58), planarization materials (9779-52) and Chemical shrink materials (9777-55). Dr. Ralph Dammel, Senior Director, Technology Office Chemicals of EMD Performance Materials and the recipient of SPIE's Frits Zernike Award for Microlithography in 2015, will be co-chairing the "DSA Novel Materials" session on February 24 at 3:50 PM at the Advances in Patterning Materials and Processes Conference. The company is also presenting on DSA at Nikon Lithovision 2016, held at the City National Civic on February 21.

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