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Advancing Digital Living – Merck KGaA, Darmstadt, Germany, Provides New Impetus at the Consumer Electronics Show 2020

- **Merck KGaA, Darmstadt, Germany, showcases leading-edge electronic materials solutions to change the way people access and display information**
- **Stage talks on innovation topics such as Smart Cities, Immersive Displays, In-Memory Computing and AI-optimized Quantum Computing**
- **Acquisitions of Versum Materials and Intermolecular strengthen Merck KGaA, Darmstadt, Germany, as a highly innovative materials provider for the electronics industry**

Darmstadt, Germany, December 16, 2019 – Merck KGaA, Darmstadt, Germany, a leading science and technology company, will present its latest innovations for the electronics industry at the Consumer Electronics Show (CES), the world's largest electronics tradeshow taking place in Las Vegas from January 7-10, 2020. As the company behind the companies advancing digital living, Merck KGaA, Darmstadt, Germany, produces leading-edge materials used in almost all the latest electronic devices. At CES 2020, senior management of Merck KGaA, Darmstadt, Germany, invites visitors to attend the stage talks that it will be holding with its own experts and external partners about visions and technology trends of the future.

"CES 2020 is the place to be for innovation and we are proud to present our exceptional solutions for the electronics industry at this venue," said Kai Beckmann, Member of the Executive Board of Merck KGaA, Darmstadt, Germany, and CEO



News Release

Performance Materials. “The data explosion era is well underway, and with our materials and solutions, we are enabling the electronics industry to harness it. We are the company behind the companies advancing digital living. At CES 2020, we will demonstrate how our high-tech solutions are helping to take technologies such as Artificial Intelligence, 5G, Internet of Things as well as Autonomous Driving and Smart Cities to the next level.”

Scientists and experts from Merck KGaA, Darmstadt, Germany, as well as external partners will hold panel discussions on four different topics crucial to further developments in the electronics industry. The following stage talks will be held at the booth of Merck KGaA, Darmstadt, Germany (Smart Cities Hall, Booth 1901, Tech East, Westgate):

- January 8, 10:30 a.m.: “Advancing digital living – from Smart Cities to the most remote places on Earth”, Kai Beckmann, Member of the Executive Board & CEO Performance Materials, Merck KGaA, Darmstadt, Germany; Gottfried Wastlbauer, Head of Marketing Display Solutions, Merck KGaA, Darmstadt, Germany; Rory Moore, EvoNexus CEO & Co-Founder
- January 8, 12:00 p.m.: “Superconducting quantum computing: from chips to full systems”, John Langan, CTO Performance Materials, Merck KGaA, Darmstadt, Germany; Daniel Franke, Associate Performance Materials Venture Fund, Merck KGaA, Darmstadt, Germany; John Levy, Founder & Co-CEO of SeeQC
- January 9, 10:30 a.m.: “The future of displays: What will it bring?”, Gottfried Wastlbauer, Head of Marketing Display Solutions, Merck KGaA, Darmstadt, Germany; Seamus Blackley, Founder & CEO of Pacific Light & Hologram; Bob O’Brien, Co-Founder & President of DSCC (Display Supply Chain Consultants)
- January 9, 12:00 p.m.: “Opportunities in neuromorphic computing”, John Langan, CTO Performance Materials, Merck KGaA, Darmstadt, Germany; Owen Lozman, Vice President of M Ventures and Head of Performance Materials Fund, Merck KGaA, Darmstadt, Germany; Wei Lu, Professor at the University of Michigan, key opinion leader in the field of Neuromorphic Computing, and co-founder and CEO of MemryX

News Release

1. Advancing Digital Living in Smart Cities

Artificial Intelligence (AI) and Internet of Things (IoT) are the digital backbone of smart cities. They enable well-being, security as well as comfort and luxury in the cities of tomorrow. The development of a smart city is vastly complex and encompasses everything from its basic infrastructure to how data is processed and governed. New technologies such as 5G including implementation with Liquid Crystal Smart Antennas are paramount to create true connectivity.

At CES 2020, visitors will have the chance to learn how materials solutions from Merck KGaA, Darmstadt, Germany, are shaping the smart cities of the future, making storage, processing and data transfer much faster and more efficient. They can also experience innovative dynamic liquid crystal windows that can be shaded within a second, contributing to energy efficiency and the Smart Cities concept.

2. The future of displays: What will it bring?

Today, displays are the central interface between man and machine. New display forms will make it possible to completely redefine long-established device paradigms. What has been rigid or immobile is becoming bendable, stretchable, rollable, wearable or bezel-less. New applications are conceivable. In classic television applications, current 4K display technology has been a significant advancement from SD or HD. To deliver a truly immersive viewing experience, however, further improvement in resolution towards 8K and 16K is needed. All these innovations depend on advances in materials science and research. As a global market and technology leader in the development and production of LC (liquid crystal), OLED (organic light emitting diode) and display patterning materials, Merck KGaA, Darmstadt, Germany, is fueling the next breakthroughs, for instance, in new, highly advanced liquid crystal technologies. An example is the eco-friendly and efficient technology SA-VA (Self-aligned Vertical Alignment) for large-area displays, allowing an immersive experience without the distraction of a bulky frame. The first TVs with SA-VA are expected on the market in 2020. In the rapidly evolving OLED display field, Merck KGaA, Darmstadt, Germany, is driving the foldable revolution by developing higher performing OLED stacks for OLED manufacturers around the world as well as actively working on next-generation OLED device fabrication via ink jet printing.

News Release

At CES 2020, visitors are invited to dive into the future of displays and obtain first-hand insights from Seamus Blackley, widely known as the creator of the Xbox, and Bob O'Brien, President of DSCC (Display Supply Chain Consultants).

3. Quantum Computing and Neuromorphic Computing

Quantum computing is poised to disrupt traditional computing methods for new applications in financial services, pharmaceutical research, logistics, quantum chemistry, and machine learning. While the science of quantum computing has been well understood for decades, a machine capable of running the most powerful algorithms known today has yet to be realized. Merck KGaA, Darmstadt, Germany, provides advanced materials highly relevant to the manufacturing of quantum technologies and is partnering with start-ups, industry partners and research institutes. SeeQC is commercializing the world's fastest superconducting rapid single flux quantum logic that can be directly bonded to the quantum chip and placed in the cryogenic fridge. Visitors to CES 2020 can learn from SeeQC founder and CEO John Levy how, together with Merck KGaA, Darmstadt, Germany, SeeQC is solving high-impact problems.

To support advances in AI, Merck KGaA, Darmstadt, Germany, is partnering with MemryX, a U.S.-based start-up that designs brain-inspired computer chips for AI applications. Conventional computing architectures are inherently unsuited to the nature of operations required to solve machine learning problems. The frequent shuffling of data between processors and memory leads to massive energy demands in data centers and becomes largely impractical in IoT or other edge computing environments. Neuromorphic chips promise higher energy efficiency and computational power by using massively parallelized computing pathways and new functional devices for simultaneous storage and computation, in analogy to the neurons in the human brain.

Merck KGaA, Darmstadt, Germany, is pleased to welcome Wei Lu, Professor at the University of Michigan, key opinion leader in the field of neuromorphic computing, and co-founder and CEO of MemryX to discuss these topics, challenges and opportunities during this panel discussion. He will share insights about how in-

News Release

memory computing chips can achieve unparalleled energy efficiency and computing density.

4. Revolutionizing semiconductor manufacturing to advance next-generation digital technologies

The digital revolution is disrupting every industry and changing our lives at exponential speed. The evidence of the striking changes can be seen everywhere – intelligent robots, drones, smart homes, cloud computing, smart industries, automation, genetic editing, just to name a few.

To push the industry forward and realize the various systems of the future, advances in semiconductor technology are critical. Newer applications and chip architectures require microchips with faster processors, increased storage, minimum power consumption and greater performance. Merck KGaA, Darmstadt, Germany, is a trusted materials innovation partner developing technologies and solutions that cover every major step of the wafer manufacturing process. With the acquisition of Versum Materials, Merck KGaA, Darmstadt, Germany, has broadened its comprehensive portfolio of innovative solutions and is exceptionally well-positioned to deliver on the existing and next generation material needs of its customers, for example Directed Self Assembly (DSA), 3D NAND, scaling in DRAM (dynamic random access memory), MPUS (microprocessor unit) and advanced packaging. For semiconductor manufacturers, being the first to the market with a new chip generation is crucial. With the acquisition of Intermolecular and additional capabilities in rapid materials screening, Merck KGaA, Darmstadt, Germany, can now offer customers faster materials innovation through parallel composition experiment and full performance testing and characterization.

The Performance Materials booth of Merck KGaA, Darmstadt, Germany, will be located in the Smart Cities hall (Booth 1901, Tech East, Westgate).

News Release

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About Merck KGaA, Darmstadt, Germany

Merck KGaA, Darmstadt, Germany, a leading science and technology company, operates across healthcare, life science and performance materials. Around 56,000 employees work to make a positive difference to millions of people's lives every day by creating more joyful and sustainable ways to live. From advancing gene editing technologies and discovering unique ways to treat the most challenging diseases to enabling the intelligence of devices – the company is everywhere. In 2018, Merck KGaA, Darmstadt, Germany, generated sales of € 14.8 billion in 66 countries.

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 EMD Serono in healthcare, MilliporeSigma in life science, and EMD Performance Materials. Since its founding 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.