

PRESS RELEASE

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Innovative partnership for resource-efficient wafer inspection

Fraunhofer IPMS and DIVE Optimize Semiconductor Processes with Cutting-Edge Measurement System

The Fraunhofer Institute for Photonic Microsystems IPMS, in collaboration with DIVE imaging systems GmbH, has achieved a major milestone in resource-efficient semiconductor manufacturing. With the successful installation of an optical measurement system by DIVE in the cleanroom of Fraunhofer IPMS, the effort required for quality control during wafer production has been significantly reduced. This collaboration paves the way for a more sustainable and efficient semiconductor production process.

Semiconductor manufacturing involves up to 1,500 process steps, including etching, deposition and lithography. Due to their complexity of structures, finished wafers must be nearly defect-free, which requires rigorous quality control. As a result, up to 50% of process steps are dedicated to metrology and thousands of additional control wafers are produced each month. This requires substantial additional financial and material expenditures as well as energy and time resources.

The project "NEST" (New Screening Tool for Efficient Semiconductor Manufacturing) directly addresses this issue. Over the past 1.5 years, DIVE, together with Fraunhofer IPMS and Fraunhofer IZM has conducted an environmental potential analysis. The study revealed that targeted inspection tools could reduce control wafer usage by at least 25%, while also saving more than 118,000 kilograms of CO₂ emissions during production every month. DIVE's solution uses an innovative combination of spectroscopy and imaging technologies capable of identifying defects even in deeper wafer layers. The analysis was based on a 28 nm manufacturing process and 25,000 wafer starts per month. The project was funded within the "[Green ICT Space](#)" by the Research Fab Microelectronics Germany (FMD).

In addition to CO₂ savings, the system offers further ecological benefits, such as the reduction of water and chemicals used in control wafer production. Furthermore, the reduction of metrology steps also improves energy efficiency by freeing up tool capacity; an early detection of process deviations avoids misproduction and improves the overall productive wafer yield, which results in an economic advantage as well.

Editor

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DIVE imaging systems GmbH develops advanced inspection tools that combine the benefits of optical spectroscopy with imaging. The DIVE VEpioneer® is the first of its kind to operate under cleanroom conditions. It rapidly assesses surface properties, contamination and deviations from production specifications in just 20 seconds. The integration of AI algorithms enables comprehensive process control while significantly reducing testing efforts. "DIVE's hyperspectral imaging systems offer a new way of non-destructive wafer inspection. With the support of Fraunhofer IPMS, this innovative technology is now available for use in standardized industrial cleanrooms – enabling significant productivity gains and cost savings for semiconductor fabs," says Martin Landgraf, R&D Manager at Fraunhofer IPMS.

After the successful conclusion of the project, the DIVE VEpioneer® system will remain at Fraunhofer IPMS's Center Nanoelectronic Technologies (CNT) for continued wafer measurement and evaluation for customers and partners. Further joint projects are planned to enhance the system with wafer handling automation and equipment integration for an automatic data transfer. With the acquisition of DIVE imaging systems GmbH by PVA TePla AG, the start-up now gains new opportunities for evaluation and development – particularly through the expertise of the material and metrology specialist.

About Fraunhofer IPMS

Fraunhofer IPMS is a leading international research and development service provider for electronic and photonic microsystems in the application fields of Smart Industrial Solutions, Bio and Health, Mobility as well as Green and Sustainable Microelectronics. Research focuses on customer-specific miniaturized sensors and actuators, MEMS systems, microdisplays and integrated circuits as well as wireless and wired data communication. Services range from consulting and design to process development and pilot series production. With the Center Nanoelectronic Technologies (CNT), Fraunhofer IPMS offers applied research on 300 mm wafers for microchip producers, suppliers, device manufacturers and R&D partners.

About PVA TePla AG

PVA TePla is a leading high-tech company for materials and metrology. Founded in 1991, the system provider develops and produces customized solutions for high-precision material production, refinement, and processing (Material Solutions), as well as systems for material and component inspection using acoustic, wet-chemical, and optical methods (Metrology). With its Technology Hub, PVA TePla operates an

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innovation center focused on application-oriented research and development of future materials. The company also supports highly specific customer needs through its own in-house R&D.

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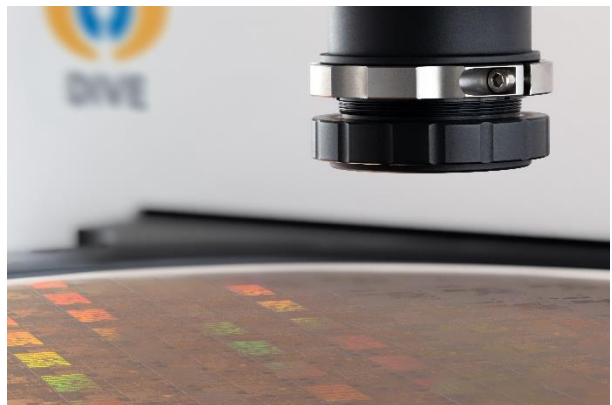
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About „Green ICT @ FMD“

The [Research Fab Microelectronics Germany](#) (FMD for its acronym in German) has established the “Green ICT @ FMD” competence center to implement the German government's Green ICT mission. The aim is to promote the ecologically sustainable development of ICT based on FMD services, structures, and expertise for application-oriented research in microelectronics.

Images

Experts from DIVE and Fraunhofer IPMS in the cleanroom at Fraunhofer IPMS in Dresden. © Fraunhofer IPMS



Imaging Systems from DIVE for a non-invasive wafer control.
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