

Extract from the Annual Report 2023
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Diamond-based systems and CleanTech

Diamond-based systems for high efficiency, performance and reliability

What are the focal points of the department?

The technological focus of the department is formed by hot-wire CVD (chemical vapor deposition), which enables the production of crystalline diamond and silicon layers on large surfaces and complex geometries. In the field of diamond coatings, the technology enables, for example, the production of extremely homogeneous crystalline diamond layers on large surfaces, sub-micrometer coatings on functional surfaces and wear-resistant coatings on complex geometries. As a result, the high demands placed on high-performance components and industrial tools – such as extreme hardness, durability, biocompatibility and chemical inertness – can be met. Amongst other things, we thereby introduce diamond – the hardest material in the world – into our customers' applications by means of our coating technology and develop, in collaboration with the customers, unique products. This is complemented by the application of atomic layer deposition (ALD), with which nanoscale, low-defect and highly conformant layers can be deposited. By combining both technologies, we are able to fulfil a wide range of requirements and further develop them for our customers' applications, such as the highly conformant functionalization of diamond and silicon structures by means of ALD layers in sensor applications."

What were the highlights in the reporting year?

We were particularly pleased that we were able to diamond-coat the internal geometries of tools such as drawing dies with high aspect ratios by means of CVD using a special system setup and to successfully extend the service life in wire production. In addition, we were able to reduce the roughness of diamond coatings with a new interlayer system, thereby significantly increasing their suitability for sheet-metal forming.

Hot-wire CVD system for the production of diamond coatings on large surfaces up to 0.5 x 1 m.

With our expertise in the provision of electrochemically generated disinfectants, we were able to contribute towards the development of a preclinical healthcare platform that can enable mobile medical care, even in remote areas of the sub-Saharan region. An expansion of our S-ALD coating system for thermal local atomic layer deposition to include a linear evaporator unit, developed in-house, will enable research into complex electron contact systems for perovskite silicon tandem solar cells in the future."

What are the plans for the future?

The supply and sustainable utilization of energy and raw materials are crucial for the future of manufacturing companies. Through new and further developed systems, coating technologies and processes, we are working in collaboration with our partners to significantly reduce the material and energy requirements and, consequently, the production costs of diamond coatings and to increase the compatibility of our coatings and processes with, amongst other things, new base materials, in order to make the advantages usable in new applications. In a recently launched project, we are researching AI-based inspection systems for the automated detection of defects and production errors during delivery, pre-treatment, coating and post-treatment. With the latest spin-offs in Canada and South Africa, we are also strengthening our internationalization for the benefit of our local partners."

#WeKnowSolutions

- Development of application-specific layer systems for diamond- and silicon-based applications
- Optimization of economic efficiency through large batch volumes and/or high-rate processes
- Development of components for the applied technologies
- Coating-oriented component design and material selection for diamond tools

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