

PRESS RELEASE

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Fraunhofer ENAS awards development of piezoelectric aluminum nitride MEMS platform with Fraunhofer ENAS Research Award 2021

The Fraunhofer Institute for Electronic Nano Systems is a specialist in the development of innovative sensors and actuators as well as their integration into application-oriented systems. The focus of the development lies on systems and novel components based on future-oriented technologies, which significantly expand the state of the art with intelligent system integration and are tailored to the requirements of the respective users. Dr. Chris Stöckel has successfully established a microsystem platform (MEMS platform) based on piezoelectric aluminum nitride and receives the Fraunhofer ENAS Research Award 2021 for this.

The Fraunhofer Institute for Electronic Nano Systems ENAS annually awards the Fraunhofer ENAS Research Prize for outstanding scientific results with high application relevance. This year, the prize goes to Dr.-Ing. Chris Stöckel, who holds a doctorate in electrical engineering. He receives the award for his research work in the field of piezoelectric microsystems, which rank among the top research on a national and international scale. Dr. Chris Stöckel is the intellectual father of this MEMS platform established at the Chemnitz site.

The technology platform uses piezoelectric aluminum nitride (AlN) to actuate moving structures or to detect very small movements. In contrast to conventionally used lead zirconium titanate (PZT), this technology is CMOS compatible, as deposition and patterning can be realized with conventional equipment for aluminum-based back-end-of-line technologies of the semiconductor industry.

Silicon and SOI wafers are used as substrate materials and spring-mass systems, tongue elements as well as membranes can be realized. The technology platform is established on a 6" wafer size and is constantly being further developed. An extension to 8" wafer size as well as the integration of AlScN are the subject of current development projects.

Already realized application examples are micromechanical mirrors for use in an endoscope or wake-up generators for energy-autonomous and currentless detection of mechanical events (such as acceleration or vibration). Other potential

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applications for membrane-based MEMS include pressure or ultrasonic transducers as well as viscosity sensors that can operate in both gases and liquids.

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The Fraunhofer ENAS Research Award for outstanding scientific achievements was presented by Prof. Karla Hiller, Chair of the Research Award Jury, Dr. Sven Zimmermann and the Institute Director Prof. Harald Kuhn. The award winner Dr. Chris Stöckel received the research award for his developments of technologies and devices for piezoelectric microsystems.

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Starting with his diploma thesis, Dr. Chris Stöckel has been continuously working since 2011 on the development of technologies for the integration of piezoelectric AlN into microsystems, as well as on innovative MEMS designs and their technological implementation for various applications, such as scanner mirrors, energy autonomous “wake-up” MEMS, PMUTs and ion filters. In 2016, he compiled his scientific results in his PhD thesis entitled “Piezoelectric aluminum nitride thin films for micro-electromechanical systems”. The results of his work have been published in a large number of scientific papers at conferences and in renowned journals. Particularly noteworthy are the contributions at Transducers & Eurosensors 2019 (Best Paper Award) and Micromachines 2022.

The **Fraunhofer Institute for Electronic Nano Systems ENAS** is the specialist and development partner in the field of Smart Systems and their integration for various applications. Fraunhofer ENAS has specialized on the challenge of combining micro and nano sensors, actuators and electronic components with interfaces for communication and a self-sufficient energy supply to form smart systems, thus supporting the Internet of Things and the ongoing digitalization. The institute develops single components, manufacturing technologies and system concepts, system integration technologies and actively supports the technology transfer for and with its customers. It offers innovation consulting and supports customer projects, starting from the idea, via design and technology development or realization based on established technologies up to tested prototypes.

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In 2022, Chris Stöckel took over the leadership of the “Technology Platforms for MEMS and MOEMS” group of the Business Unit “Process, Device and Packaging Technologies” of Fraunhofer ENAS together with Prof. Karla Hiller.

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The Fraunhofer ENAS Research Award has been presented once a year since 2011 by the Fraunhofer Institute for Electronic Nano Systems ENAS in Chemnitz for outstanding scientific results with high application relevance in the field of micro- and nanotechnologies and is endowed with 5,000 euros. In 2020, the award ceremony was held as a virtual event. Now it has been moved to the summer to allow for a face-to-face event. During the award ceremony, the award winner presented his research work. The laudation was held by Dr. Detlef Billep, since 2022 second managing director of EDC Electronic Design Chemnitz GmbH.

Prior to the award ceremony, the Lord Mayor of the City of Chemnitz Sven Schulze, the Managing Director of iSAX GmbH & Co KG Heike Vocke and the Prorektor for Transfer and Continuing Education of Chemnitz University of Technology Prof. Dr. Uwe Götze gave welcoming speeches followed by a panel discussion under the topic “Development of the Chemnitz location”. Besides the moderator Rainer Kaltschmidt, head of Business Unit “Systems and Applications”, all greeting speakers, the institute director of Fraunhofer ENAS, Prof. Dr. Harald Kuhn, and the laudator Dr. Billep participated.