

PRESS RELEASE

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Piezoelectric Micro Sensors based on aluminum nitride for Industrial Applications

Fraunhofer ENAS presents its research results on fabrication and application of aluminum nitride layers at the SENSOR+TEST in Nuremberg.

Fraunhofer ENAS develops piezoelectric micro systems using aluminum nitride (AlN). These microsystems contain a high energy density which allows the miniaturization of MEMS and NEMS. Therefore, costs and energy consumption in the fabrication process of the microsystems can be reduced and the areas of application increases. In contrast to the common used lead zirconate titanate (PZT), the aluminum nitride can easily be integrated in CMOS processes. The deposition and patterning of AlN can be realized in conventional equipment for aluminum-based back-end of line technologies. This enables the common fabrication of piezoMEMS and CMOS devices in the same production line. Fraunhofer ENAS and the Center for Microtechnologies of Chemnitz University of Technology developed a technology to sputter and characterize piezoelectric thin film AlN and integrate this material in silicon-based MEMS and NEMS applications.

At the SENSOR+TEST, Fraunhofer ENAS shows application samples for aluminum nitride-based sensor and actuator systems. The institute introduces a wake-up generator detecting mechanical events, such as acceleration or vibration, and transform the mechanical energy into electric energy by using thin aluminum nitride layers to activate a stand-by system (sleeping system). An acceleration larger than 0.08 g is needed to generate sufficient energy for the wake-up process. The wake-up generator measures inertial events with no need of any power supply. A system, consisting of ASIC and MEMS requires less than 300 nA current consumption.

This piezoelectric transducer is of great interest for industry as sensor and actuator material. To realize these industrial applications, Fraunhofer ENAS together with the Canadian company Preciseley Microtechnology Inc. and EDC Electronic Design Chemnitz GmbH has developed a piezoelectric MEMS, which was integrated as position sensor into the high volume production of the Canadian partner. Further-

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Editors

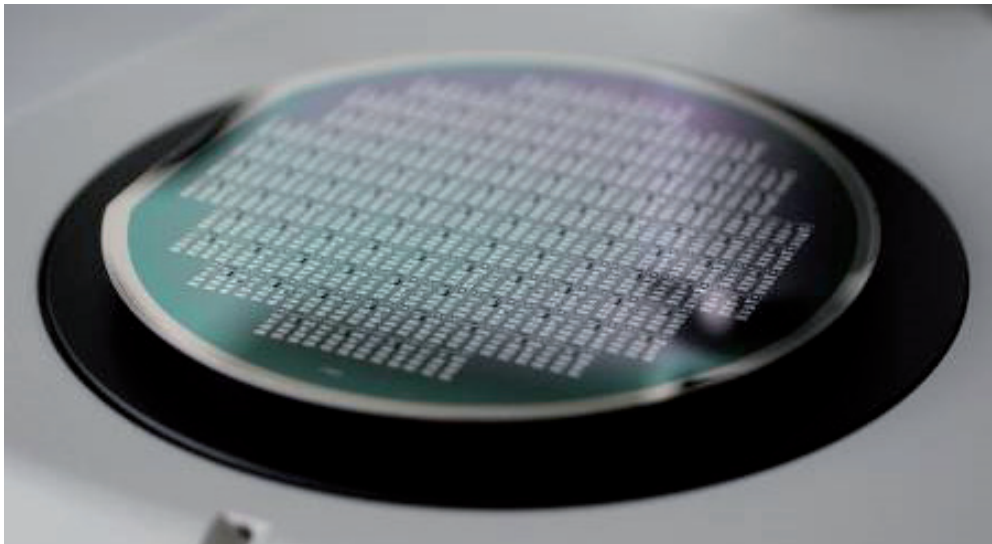
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more, the project partners have realized an ASIC, which showed a fast, precise and low-noise measurement of the piezoelectric sensor signal. At the Fraunhofer pavilion, Fraunhofer ENAS demonstrates the advantages of aluminum nitride-based systems by means of a piezoelectric MOEMS. This actuator offers a high scan angle of up to 100° at a low actuation voltage of less than 20 V and is reliable during temperatures of up to 150 °C.

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Piezoelectric aluminum nitride MEMS on wafer level.

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