



Presseinformation

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Experts met to discuss progress and requirements on silicon MEMS reliability

Halle - On February 27/ 28, 2006, an International Symposium on "Mechanical Reliability of Silicon MEMS – Recent Progress and Further Requirements" was held in Halle (Saale), Germany, at the Fraunhofer Institute for Mechanics of Materials IWM.

Since silicon is by far the dominating structural material in millions of microelectromechanical sensors and actuators (MEMS) produced every year, there is an increasing interest of both – industry and science – in the better understanding of factors limiting the reliability of those components. Therefore during the symposium speakers from industry, research institutions as well as from universities proposed the following topics: market trends, reliability requirements, strength characterization, dynamic analysis, fatigue wear, and accelerated testing.

About 60 attendees from industry (40 %), research institutions (40 %) and universities (20%) from 8 countries were listening to 19 presentations. In a final panel discussion, talks were summarized and further requirements such as the need for standards in testing were discussed.

In the introductory session, Dr. Roland Müller-Fiedler of Robert Bosch Company and Dr. Michael Wagner of the Fraunhofer Institute for Photonic Microsystems IPMS described reliability requirements for automotive and optical applications. A talk followed on market analysis for silicon MEMS by Olivier Nowak from Wicht Technology Consulting. He pointed out that from all MEMS produced, more than 90% are silicon-based, and this rate will not significantly change within the next five years. Dr. Uwe Behringer from UBC Microelectronics reported on the current SEMI standardization activities in the MEMS sector and invited all attendees to the next European MEMS standardization meeting, which will take place at the SEMICON Europe in Munich in the first week of April.

In a second session on "Strength Testing and Analysis", recent results on micro- and nanoscale testing of silicon as well as methods for strength and reliability analysis were presented by speakers from the University of Southampton, University of Illinois, University of Wisconsin-Platteville, and the Fraunhofer Institute for Mechanics of Materials IWM in Halle. On the second day of the

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Symposium speakers from Polytec, University of Wuppertal, Freescale, and IMEC described testing approaches to the dynamic MEMS characterization. Testing systems were presented for MEMS eigenfrequency analysis, parameter estimation, and characterization of stresses at silicon structures during shock loading. In a session on fatigue and wear of single and polycrystalline silicon, speakers from Penn State, Bosch, Case Western Reserve University, Sandia National Labs, and DelfiMEMS reported on their results. Different microstructural models were discussed to explain the observed fatigue effect in silicon, an effect that does not occur at the macroscopic level.

The final panel discussion with members from Bosch, Elmos, Polytec, Fraunhofer Institute for Photonic Microsystems, and Penn State was chaired by Dr. Joerg Bagdahn from the organizing Fraunhofer-Institute for Mechanics of Materials IWM. Members from Industry noted that the proof of MEMS reliability is one of the key factors for a long-term market success. Furthermore, it was emphasized that recent research results from academic institutions on the factors affecting the reliability have to be transferred into the industrial MEMS design. The need for standards was discussed as well. It was suggested to initiate a round robin aiming on the definition of standards for fatigue tests. Furthermore, it was concluded that a standardization of test interfaces and data evaluation are required during reliability testing, especially during production. This topic was also discussed at the MEMUNITY workshop, which took place on March 1 at the Fraunhofer Institute for Mechanics IWM in Halle.



picutre 1: between presentations



picture 2: panel discussion at the end of the symposium, from left to right: Jörg Bagdahn of Fraunhofer Institute of Mechanics of Materials IWM, who chaired the discussion, Chris Muhlstein of PennState University, Roland Krumm of ELMOS Semiconductors, Christian Rembe of Polytec, Michael Wagner of Fraunhofer Institute for Photonic Microsystems IPMS, Roland Müller-Fiedler of Robert Bosch Company.

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