SOI based platforms for next generation MEMS manufacturing

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Abstract:

The rapidly growing IoT industry sets new demands for microelectromechanical system (MEMS) devices, the central building blocks of smart systems. Advanced MEMS devices are commonly built on thick-film bonded Silicon-On-Insulator wafers (BSOI), to gain benefits in precision and control of MEMS structures, device miniaturization and packaging.

Requirements for lower cost and higher volumes are driving towards sensor miniaturization, which requires higher precision BSOI starting materials to maintain existing level of device performance. Requirements for reliability and performance improvements on the other hand drive for improvements in precision of BSOI materials, and use of hermetically sealed structures enabled by Cavity SOI (C-SOI) wafers or wafer level packaging.

Okmetic solutions to these challenges are:

- Enhanced SOI (E-SOI) wafers, which are thick BSOI wafers with superior device layer thickness uniformity, independent of layer thickness
- C-SOI wafers, which enable part of sensor structures to be built into the SOI wafer as part of the wafer manufacturing process
- Through Silicon Vias (TSV) for sensor interconnections in wafer level packaging
- Combinations of above technologies

During the presentations application examples of these wafer types will be shown. In case of E-SOI technology, case studies about sensor miniaturization, reducing variation in existing sensor designs and enabling completely new application areas are presented. For C-SOI, the requirements of industrial manufacturing, such as element level process data are discussed. Application examples for TSV show how Okmetic poly silicon VIAs can be used for wafer level packaging and how they can be combined with BSOI and C-SOI technologies.

Presenter:

Mr. Lempinen received his M.Sc. in Materials Physics in 1999. Mr. Lempinen has over 15 years of experience in Silicon based material engineering. He has worked for Okmetic since 2000 and held various positions related to R&D, process engineering and applications support. Currently he is working as Senior Manager, Customer Support being responsible for the company's global technical customer support organization. Prior to his time at Okmetic, Lempinen was involved in photovoltaic research in Electron Physics laboratory of Helsinki University of Technology, Finland and Microelectronics Research Center of Iowa state University, U.S.A.