

# 1 Preface

As in preceding years, the Center for Microtechnologies in close cooperation with the “Micro Devices and Equipment” Department Chemnitz of the Fraunhofer Institute for Microintegration and Reliability (FhG-IZM) in Berlin has further consolidated its position as a Center of Excellence in the fields of *microelectronics back end technologies* and *microsystem technologies*.



The key to our success was an interdisciplinary cooperation of several chairs within the ZfM. Based on this idea, ZfM's primary mission is to provide an intellectual and working environment that makes possible education through teaching and research in areas that require or may benefit from advanced ULSI-interconnect technologies, Si-nanotechnology and new developments and ideas in the field of MEMS by using microfabrication technologies. ZfM's technology laboratories provide a complex of modern microelectronics laboratories, clean rooms and microfabrication facilities.

The evaluation procedure for the Collaborative Research Center No. 379 of the German Research Foundation (DFG) for the period 2004 – 2006 took place in June 2003. The experts of a nominated and appointed evaluation board certificated the excellence of the research work in the MEMS field and recommended the support of the DFG for the period of 2004 – 2006.

**Meanwhile the Fraunhofer IZM Department Micro Devices and Equipment Chemnitz exists 5 years. The successful integration of MEMS packaging, MEMS system development and equipment as well as process simulation in cooperation with the ZfM has become more and more apparent.**

It is my pleasure to summarize some of the scientific highlights of 2003:

- A new method for MEMS capping by low temperature and selective adhesion bonding has been developed and verified.
- Verification of the AIM technology by fabrication of inclinometer prototypes and successful functional testing by industrial partner.
- First prototypes of a novel high precision Si-gyroscope have been fabricated successfully.
- Tunable infrared filter based on Fabry-Perot-Interferometer suitable for gas analysis systems have been tested successfully.
- Miniaturized NIR/MIR-spectrometer based on micro mechanical scanners with integrated gratings appropriate for substance analysis in gaseous, liquid and solid state has been developed.

- Measurement and comparison of the thermal conductivity of a variety of low k and ULK dielectrics as well as thermal modelling of low k material containing interconnect schemes
- Development of an ultrathin, amorphous PECVD WN diffusion barrier for Copper damascene metallization with a thermal stability of up to 600°C
- SiO<sub>2</sub> aerogel as ultra low k dielectric integrated into 3-level Copper metallization of RF devices showing decreased capacitive coupling and improved Q-factor of inductors (in close cooperation with Infineon Technologies)
- New reduced order modelling features of MEMS provide efficient means for data exchange from component models to circuit and system simulation environment.
- Novel frequency selective vibration sensor arrays have been successfully integrated into a user programmable vibration measurement unit for wear state monitoring.

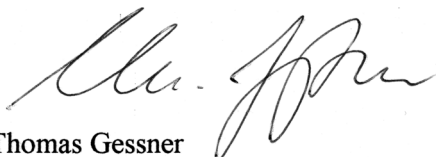
The 2003 Annual Report of the Center for Microtechnologies provides an overview of the facilities, staff, faculty and students associated with the ZfM, as well as a description of many of the ongoing research projects which make use of the ZfM facilities.

These developments, which are based on close links with industry and cooperation with German as well as international institutes, contribute to an advanced education for our students. We kindly acknowledge the support of the Federal Ministry of Research, the German Research Foundation, the Saxon Ministry of Science and the European Commission.

As always, we are driven by our triple aims of excellence in education, scientific and technological research and by providing a comprehensive range of research and development services to industry.

I would like to thank all my colleagues, the scientific fellows and technicians for all their dedicated work.

I look forward to participating in the promising development of new devices and concepts through the use of silicon technology.



Thomas Gessner  
Director of the Center for Microtechnologies

## *Guests of the ZfM and celebrations*



*Prof. Thomas Gessner was appointed Advisory Professor at the University of Chongqing, China*

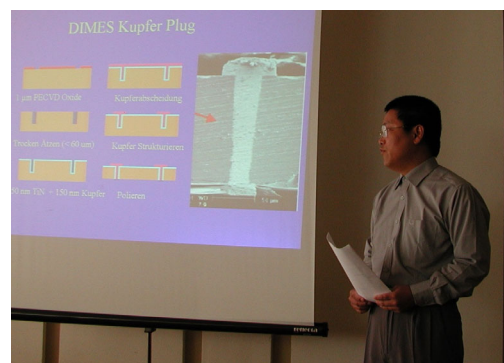
*July 2003*

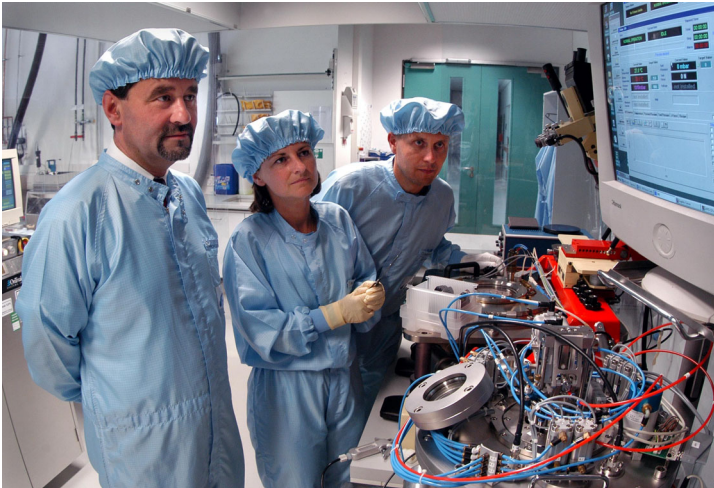
*Chinese Delegation at the ZfM,*

*October 20, 2003*



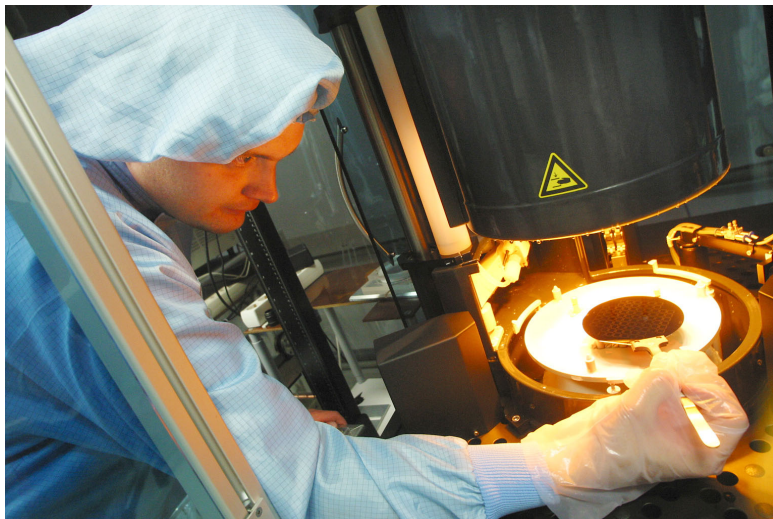
*Seminar of PhD students:  
Jia Chenping, Xian  
China*





**Fraunhofer** Institut  
Zuverlässigkeit und  
Mikrointegration

*Branchlab Chemnitz*  
*Micro Devices and Equipment*



*Technology steps for  
wafer bonding*

