

# JOURNAL OF TELECOMMUNICATIONS AND INFORMATION TECHNOLOGY

## *Preface*

Despite the fact that a range of limitations are beginning to appear as CMOS technology is being raised to ever higher levels of perfection, it is anticipated that silicon will be the dominant material of the semiconductor industry for at least the first half of the 21st century. The forecast for microelectronics development published in 2006 by Semiconductor Industry Association (SIA) reaches ahead to the years 2014–2020. Moreover, a comparison with former SIA forecasts indicates that they become more aggressive (that is more optimistic) with time.

While the development of silicon microelectronics in the past could be attributed mostly to the reduction of the feature size (progress in lithography), today it relies more on new material solutions, such as SOI, SON, SiGe or SiC. The combination of this trend with continuous miniaturization provides the opportunity of improving IC functionality and speed of operation.

Telecommunications and information technology are arguably the most powerful drivers behind microelectronics product development nowadays. Plenty of new applications are being created for fast analog and rf circuits, as well as for information processing ones. It is clear that with the anticipated peak  $f_{\max} = 425$  GHz and  $f_T = 385$  GHz to be reached by rf SiGe-base bipolar transistors in 2011, according to the 2006 issue of ITRS, a lot of effort must be put into the development of appropriate material, processing, characterization and modeling. While progress in the bipolar technology is impressive, the increase of MOSFET speed is even more so. The same issue of ITRS predicts on-chip clock of 73 GHz for 2020, which will require MOSFET internal switching speed of 12 500 GHz.

High-speed isn't, however, everything. Portable wireless products push, for obvious reasons, for low-power solutions. This trend requires new architectural solutions (e.g., channel thinning), and in consequence, new material, such as SOI (or its possible successor SON), where current driveability is considerably higher than in conventional MOSFETs.

In this issue the Reader will find the invited lectures presented during the 7th Symposium Diagnostics & Yield: Advanced Silicon Devices and Technologies for ULSI Era, which took place at Warsaw University of Technology on June 26–28, 2006. A number of the papers are devoted to advanced materials, such as SOI, SiC and SiGe and the most important issues concerning semiconductor technology (difficulties faced by CMOS technology, gate-dielectric

fabrication, wafer-cleaning problems). Several papers address also semiconductor structure characterization (DC and noise analysis, wideband characterization) and modeling (negative bias temperature instability).

We hope the Readers will find this issue useful and interesting.

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