

Preface

Rumors about forthcoming twilight of silicon-based microelectronics seem to be exaggerated. Microelectronics has been continuously developing for the past three decades – for instance every three years a new generation of memories becomes available on the market with the capacity four times larger than that of the previous generation. The current „official” development forecast published by SIA (Semiconductor Industry Association) reaches ahead to the years 2012–2015. There are, however, more aggressive forecasts available that reach even as far as the year 2020.

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, SiGe or SiC. The combination of this trend with continuous miniaturization provides the opportunity of moving into the range of very high frequencies.

Silicon microelectronics for fast analog and RF circuits, as well as for mainstream wireless and computational applications – these are the new application areas in telecommunications, which is one of the most powerful drivers of microelectronics product development. It is clear that with the anticipated $f_{max} \approx 50$ GHz and $f_T = 40$ GHz to be reached by RF transistors in 2005, according to the International Technology Roadmap for Semiconductors (SIA, 1999), a lot of effort must be put into the development of appropriate material, processing, characterization and modeling. However, such an outstanding progress will not happen without increased speed offered by new material solutions. As is generally known, carrier mobility in SiGe is several times higher than in silicon due to internal strain. On the other hand, higher speed of operation in SOI devices is achieved mainly due to the reduction of parasitic capacitances.

High-speed is, however, not everything. Portable wireless products push, for obvious reasons, for low-power solutions. This trend, too, requires new material, such as SOI where current drivability is higher than in conventional devices due to reduced thickness of the active region.

In this volume the Reader will find a selection of papers and lectures (part I of two parts) presented during the conference „Advanced Silicon Devices and Technologies for ULSI Era”, which took place in Museum of Earth, Warsaw, Poland on 28–30 June 2000. A number of these papers is devoted to high-speed silicon-based microelectronics devices, e.g. Silicon Germanium (SiGe) structures as well as their new application fields, e.g. MicroElectroMechanical Systems (MEMS). There are also papers related to no less exciting and prospective domains of microelectronics (e.g. high-power and high-temperature electronics, etc.), the development of which is currently being tightly associated with the progress in SOI or SiC device technology.

We hope that Readers will find these Proceedings useful and interesting.

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