Preface

This book is devoted to fast the evolving field of modern material science and nanoelectronics, and more particularly to physics and technology of functional nanomaterials and devices. The book focuses on nanodevices for electronics, sensors, and energy harvesting, considering as main device structure—the semiconductor-on-insulator (SemOI) one. The book reports the recent achievements in this field from leading companies and universities in Europe, Russia, and Ukraine. It is articulated around four main topics: (1) Nanoscale CMOS materials and devices; (2) Beyond CMOS materials, devices and their diagnostics; (3) New functional nanomaterials and nanoscaled devices for energy harvesting, light emission, optoelectronics and THz range: (4) NanoSensors and MEMS/NEMS.

Part I is focused on new SemOI materials for More Moore and More-than-Moore applications. Ultrathin silicon SOI structures are necessary for production of fully depleted SOI devices of the 22 nm technology node and beyond. The materials innovation for RF electronics, Si-based photonics, and 3D integration are presented. Device solutions for very low-energy computing, high-performed tunnel FETs, 3D nanowire RAM cells, and mechanical flexible CMOS devices on plastics are described.

Part II of the Book deals with the physics of novel "beyond CMOS" devices such as IR memory cells on basis of Si/Ge nanoheterostructures, nonvolatile memory based on graphene on ferroelectric substrate, Si spintronic devices and the AFM diagnostics for different functional nanostructurated material and devices.

In Part III, we focus on functional nanomaterials and structures regarding self-powered systems, solar energy harvesting structures, and THz electronics. Also nanocomposite dielectric materials for light-emitting materials and other optoelectronics applications are also discussed.

Part IV considers the application of SemOI nanowire structures for radiation sensors, biosensors, chemical sensors, and MEMS. The use of SemOI substrates allows a considerable increase of the sensitivity of the sensors, as well as the

fabrication of MEMS compatible with CMOS technology. Additionally, Si and SiC nanodot materials are considered as fluorescent markers in different biomedical applications.

This book will be useful not only to specialists in nano, microelectronics, and functional nanomaterials but also to students and to the wider audience of readers who are interested by new directions in modern material science, electronics, and optoelectronics.

Alexei Nazarov
Francis Balestra
Valeriya Kilchytska
Denis Flandre

http://www.springer.com/978-3-319-08803-7

Functional Nanomaterials and Devices for Electronics, Sensors and Energy Harvesting

Nazarov, A.; Balestra, F.; Valeriya, K.; Flandre, D. (Eds.)
2014, IX, 469 p. 318 illus., 67 illus. in color., Hardcover
ISBN: 978-3-319-08803-7