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book reviews

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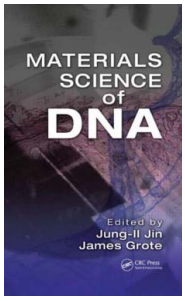

Materials Science of DNA. Edited by J.-I. Jin and J. Grote. Pp. 326. Boca Raton: CRC Press, Taylor & Francis Group, 2012. Price (hardcover) GBP 76.99. ISBN 978-1-398-2741-3.

Since 1953 when the famous paper by Watson and Crick on '*Molecular structure of nucleic acids: A structure for deoxyribose nucleic acid*' was published in *Nature*, DNA has been the subject of intensive biological, biochemical and biophysical research. What is more, in basic physics and materials science, phenomena such as molecular recognition and the self-assembly behaviour of DNA have caused a rapid increase of research interest. Extended studies of the mechanical, electrical, electro-optical and optical properties of single-stranded and double-stranded DNA have been performed, and a broad variety of two- and three-dimensional structures have been produced by self-assembly of oligonucleotides. About ten years ago a new development was initiated with the breakthrough of the group of Naoya Ogata from Chita Institute of Science and Technology, Hokkaido, when they succeeded in producing purified DNA-surfactant free-standing films from cheap waste products of the salmon fishery industry in Japan. Together with the development of tailored doping of these structures, this development opened the way for materials engineering based on semiconducting DNA thin-film structures. Today in the scientific community it is supposed that these materials may form the basis for future bioorganic micro- and nanoelectronics. However, with respect to the technological level, we are probably today at silicon's mid-1950s point of development.

The topics presented in this book highlight the most important subjects and perspectives of materials science of DNA. The main contributions have been written by three pioneer groups in this field: the Air Force Research Laboratory (AFRL), Wright–Patterson Air Force Base, Ohio, USA, the Gwangju Institute of Science and Technology and Korea University, Seoul, Republic of Korea, and the Ogata Research Laboratory, Hokkaido, Japan. Additionally, there are contributions by authors from Italy, China and Germany.

After a short introduction to basic aspects of the structure and properties of DNA, the following topics are discussed: Nanostructures and nanomaterials *via* DNA-based self-assembly; Intercalation of organic ligands as a tool to modify the properties of DNA; DNA and carbon-based nanomaterials; Electrical and magnetic properties of DNA; DNA ionic liquids; DNA-surfactant thin-film processing and characterization; Application of DNA to photonics and biomedicals; DNA-based thin-film devices; Nucleic acid-based biosensors; Perspectives of materials science of DNA. In all of the papers the reader gets a very good overview of the recent research activities worldwide. For each subject extensive bibliographic data are given. Most interesting are the chapters on electrical and magnetic properties of DNA, DNA-surfactant thin-film processing and characterization, application of DNA to photonics and biomedicals, and DNA-based thin-film devices. First examples of device developments such as an electro-optic waveguide modulator, DNA-based field effect transistors and electron-blocking layers in organic light-emitting diodes hold much promise for future use of DNA in thin-film devices. However, the authors always state that much more has to be done and to be learned before commercial devices can be realized. Thus the book is written in the spirit to stimulate the interdisciplinary community to intensify their research endeavour to bring maturation to this interesting, emerging field of molecular-scale materials science.

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