International Journal of Theoretical Physics ... ISSN 1524-4674
Volume 17, Number 1, pp. 73-74

BOOK REVIEW

"DIAMONDOID MOLECULES: With Applications in Biomedicine, Materials Science, Nanotechnology & Petroleum Science" by G.A. Mansoori, P. Lopes Barraos de Araujo and E. Silvano de Araujo, [Hardcover: 400+ pages, Language: English] World Scientific Pub. Co., Hackensack, NJ (2012). ISBN=10: 9814291609; ISBN=13: 978-9814291606; Edition: 1

As it is well described in this book, diamondoids are a peculiar class of organic molecules (hydrocarbons) with unique structures and properties. They possess typical characteristics of diamond face-fused cages with hydrogen terminated dangling bonds. Diamondoids and their derivatives have been of great interest since their discovery, due to their important and diverse roles in biomedicine, materials science, petroleum science, and more recently in nanotechnology. Due to their six or more linking groups, they have found major applications as templates and as molecular building blocks in nanotechnology, polymer synthesis, drug design and delivery, DNA-directed assembly, and in many other areas.

I was impressed by this work, because it showed me how many useful properties and possible applications diamondoid molecules possess that can be beneficial to my field of research. Here are some examples of diamondoid properties and current applications discussed in the book. Diamondoids have very high melting points as compared with other hydrocarbons and organic molecules. Diamondoids have negative electron affinities and they are transparent to visible light and high electrical insulating properties as diamond. And they are one of the growing categories of molecules highly being considered for molecular building blocks in design of NEMS, MEMS, wet nanotechnology / nanobiotechnology and in biomedicine. Diamonodoids are already being used to design drugs in fighting infectious diseases like Influenza Viruses and HIV, bacterial infections like Gram-positive bacteria and MTB *(Mycobacterium tuberculosis*), and in parasitic infection treatments like antimalarial drugs, Also they are used in fighting cancer with diamondoids derivatives in cancer chemotherapy and anticancer drugs, as a neuroprotective agent for Alzheimer`s disease, in drugs with antidotal effects, in drugs with hypoglycemic action, in drugs for diabetes treatments, in drug delivery and drug targeting.

The book consists of seven chapters with many appropriately arranged and designed tables, figures, and graphs. It also contains an excellent and lengthy glossary. In Chapter 1, the molecular structure and chemistry of diamondoids is presented. That includes classification and crystalline structure of diamondoids, distinction between diamondoids which are well-defined molecules and nanodiamonds which are, in principle, nanoparticles. The authors also present the synthesis and functionalization of lower diamondoid cages including adamantane, diamantane, and triamantane. In Chapter 2, the authors present a

detailed information and data about the existence, genesis and role of diamondoids in petroleum and other fossil fuels. This includes the use of diamondoids as geochemical tools for petroleum characterization and their role in petroleum and natural gas flow fouling. Also methods for separation, detection and measurements of petroleum diamondoids are discussed. In Chapter 3, the authors report on the available data and correlations on physical properties of diamondoids including their spectrometric, optical and thermodynamic properties. Chapter 4 of this book is about diamondoids as molecular building blocks for nanotechnology. This includes the futuristic mechanosynthesis based on diamondoids, applications of diamondoids as molecular components of nanosystems, and their use for host–guest chemistry and in inclusion compounds. Quantum calculation methods and results regarding prediction of the properties of diamondoids are reported in Chapter 5. That includes electronic, structural, and intermolecular interactions properties of diamondoids and derivatives. Chapter 6 highlights the diverse and growing biomedical applications of diamondoids. Hence, subjects such as drug design and delivery in fighting infectious diseases, cancer, hypoglycemia, and diabetes with diamondoids derivatives are discussed. Applications of diamondoids in materials science in macro and nano scales are described in Chapter 7. For macroscopic systems, this includes applications of diamondoids in polymer synthesis, in polymer nanocomposites and in crystal engineering. For nanosystems, the authors show applications of diamondoids in the design of diamondoids–DNA nanostructures and self-assembly of diamondoid molecules and derivatives towards NEMS and MEMS productions.

This is a highly educational and informative book, which I recommend to all students and researchers of physics, chemistry, nanomedicine, nanotechnology and materials science.

Dr. Renat Letfullin
Professor
Editor for International Journal of Theoretical Physics, Group Theory and Nonlinear Optics
Department of Physics and Optical Engineering
Rose-Hulman Institute of Technology
5500 Wabash Avenue, CM 192
Terre Haute, IN 47803-3999, US
Phone: 812-877-8570
E-mail address: letfullin@rose-hulman.edu
http://www.rose-hulman.edu/~letfulli/