

26th International Conference on **Advanced Nanotechnology**
&
2nd Edition of International Conference on
Materials Technology and Manufacturing Innovations

October 04-05, 2018 Moscow, Russia

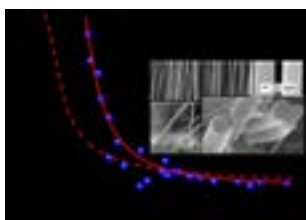


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Size-dependent behavior of electrospun polymer nanofibers

Some open problems concerning polymer materials of reduced sizes and dimensions are discussed. The lecture will focus on the mechanical and thermodynamic properties of polymer nanofibers fabricated through electro-spinning which have attracted much attention recently because of their unique features compared to the bulk. More specifically, electrospun polymer nanofibers demonstrate so-called “size-dependent behavior” when thermo-mechanical properties of material start to depend on fiber’s diameter, if their diameters are small enough. For example, abrupt increase in polymer nanofiber elastic modulus has been observed when diameters drop below a certain value. In addition, temperature dependence of elastic modulus is highly influenced by fiber diameter. Also, a shift in the glass transition and melting temperatures is observed. The physical aspects of the problem in question will be discussed. The key point of the proposed speculations is based on confinement concept: it is assumed that size-dependent behavior is related to confinement of non-equilibrium supermolecular microstructure of electrospun polymer nanofibers which is formed during their fabrication.



Recent Publications

1. A Arinstein, M Burman, O Gendelman and E Zussman (2007) The effect of supermolecular structure on polymer nanofiber elasticity Nature Nanotechnology 2:59-62.
2. A Arinstein (2017) Electrospun Polymer Nanofibers. Pan Stanford Publishing ISBN-9789814745277.

Biography

Arkadii Arinstein has completed his PhD in Theoretical and Mathematical Physics at the Landau Institute for Theoretical Physics-Russian Academy of Sciences in 1982. For many years, he worked at Semenov Institute for Chemical Physics of the Russian Academy of Sciences where he has completed his DSc in Chemical Physics in 1995. Now, he is the Research-Professor at the Technion-Israel Institute of Technology. His research interests include “Statistical physics of polymers and, non-linear phenomena and kinetic processes in disordered systems”. In the last 10 years, his studies are devoted to the physics of electrospun polymer nanofibers.

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