Mohamed Shaat, J Nanomed Nanotechnol 2014, 5:5
http://dx.doi.org/10.4172/2157-7439.S1.018

OMICS Group Conferences
Accelerating Scientific Discovery

4th International Conference on
Nanotek & Expo
December 01-03, 2014 DoubleTree by Hilton Hotel San Francisco Airport, USA

Mechanics of nanodevices and nanosensors

Mohamed Shaat
Zagazig University, Egypt

Usually NEMS for sensing applications use nanosized mechanical resonators made of nanostructured materials (.i.e., nanocrystalline materials, nanoparticle composites or nanoporous materials). Therefore, to examine their ability to work efficiently, the discrete and the inhomogeneity natures of the material structure of the mechanical resonators have to be investigated. Although of its less computational efforts when compared with molecular dynamics, classical continuum mechanics has shown some drawbacks for investigating the unique properties and the unusual behaviors of the nanosclae structures such as nanobeams, nanoplates, nanotubes, etc. Therefore, some higher-order continuum theories had been developed to account for the size-effects of the material structure which makes them widely applied for NEMS and nanosensing applications. We present here a continuum model equipped with an atomic lattice model to physically discuss some of the higher-order continuum theories and their applications for nanodevices and nanosensors. This model reveals that the elastic domain of material is considered consisting of an infinite number of material particles idealized as microvolumes. Each individual microvolume could be a single crystal for polycrystalline materials, a single grain for granular materials or a set of molecules for amorphous materials (like polymers). The material particle is allowed to deform and to move inside the material structure such that additional degrees of freedom are provided to account for the size-effect of the mechanical resonator. Once the size of the resonator becomes comparable to the size of its material microstructure, these additional degrees of freedom will significantly affect its sensing performance.

Biography

Mohamed Shaat had gained his BSc in Mechanical Engineering, 2007 and his MSc in the field of mechanics of micro/nanostructures in 2012 from Zagazig University, Egypt. He had contributed for almost 15 international publications in the fields: Continuum mechanics, MEMS, Mechanics of micro/nanostructures, and composite and functionally graded materials. Recently he is working in investigating effects of the inhomogeneity nature of the material structure on the performance of mechanical elements in different applications (bio-mass sensing, gyroscopes, energy harvesting, micro/nano-actuators).

ShaatScience@yahoo.com