**On physical properties of nanoparticles: size effect and scale of nanoobjects**

**Uglov V. V.**

**Doroshevich I. L.**1

**Kvasov N. T.**

**Remnev G. E.**

**Shymanski V. I.**

1 Belarusian State University of Informatics and Radioelectronics

**Abstract.** A transition border between macroscopic and nanoscale states of solids associated with change of its physical properties is certain to exist. The change of mechanical, magnetic, thermal and other properties of nanoparticles may be due to the surface tension, decrease in coordination number in the top-surface layer, rebuilding of the electron shell structure, change of the symmetry group of the crystal lattice and the binding energy. Different defects of the structure can also have significant influence on the physical properties of nanoparticles. A violation of the Neumann principle with decrease of the crystal sized is constant discussed in the literature. In the present work the dependence of elastic module, Debye's temperature, melting point, thermal expansion coefficient, magnetic structure on a size of metal nanoparticles (first of all iron nanoparticles) is discussed. On the basis of the obtained results the scale border between nano- and macroscopic states is justified. In the present work the peculiarity of the physical processes (melting, diffusion, defects complexes formation) occurring in nanoparticles and nanomaterials is discussed. (© 2016 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim).

**Keywords:** nanoparticles, size effect, Young’s modulus, surface tension, coordination number, magnetic properties.

<http://onlinelibrary.wiley.com/doi/10.1002/pssc.201600039/full>