Difference and similarity in properties of bulk and nanomaterials as seen by NMR

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In order to understand why properties of bulk compounds and nanostructures are sometimes different and sometimes similar, I will discuss the results of Nuclear Magnetic Resonance studies of the local crystal structure, electronic structure, nature of chemical bond and defects in carbon nanotubes, fullerenes, polyhedral multi-shell carbon nanoparticles, nanodiamonds, as well as in boron nitride nanotubes, tungsten and molybdenum sulfide fullerene-like nanoparticles, dithallium selenide nanorods, and vanadium oxide nanotubes. The properties of the corresponding bulk samples vary from wide gap semiconductors to semimetals. The data obtained for the nanosized compounds will be compared with those of the bulk ones. Our research elucidates when the properties of nanomaterials differ significantly from those of bulk samples, and when this difference is small or nearly absent.

Our studies also show that some nanoparticles reveal core-shell structure, while the others do not. This problem will also be discussed in the presentation.