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Role of trioctylphosphine on quantum size effect in Ni nanolattice

Gunadhor S Okram
UGC-DAE Consortium for Scientific Research, India

Nickel nanoparticles are of special interest for their attractive potential applications in magnetic resonance imaging, magnetic fluids, catalysts, magnetic recording media, rechargeable batteries, optoelectronics, conducting paints, magnetic hyperthermia, and other biomedical applications. When these nanoparticles are dispersed in a liquid medium for example, they tend to agglomerate/ disperse due to van der Waals or other attractive forces. Similarly, what kind of forces they may need to form their own periodic lattice in solid state and how this will influence their overall properties may be intriguing. We have investigated some of these aspects. They revealed that trioctylphosphine is responsible for their nanolattice formation, how the Ni atoms are arranged in these nanoparticles, how their electronic density of states changes, nearest-neighbour atoms are changed with particle size and why their quantum size effect is unique in heat capacity, not in electronic or magnetic properties. Some of these shall be discussed briefly.

e: okram@csr.res.in

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