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Accession Number

12395280

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Title

Electromagnetic absorption mechanisms in metal nanospheres: Bulk and surface effects in radiofrequency-terahertz heating of nanoparticles

Source

Journal of Applied Physics, vol.109, no.12, 15 June 2011, 124306 (6 pp.). Publisher: American Institute of Physics, USA.

Abstract

We report on the absorption of electromagnetic radiation by metallic nanoparticles in the radio and far infrared frequency range, and subsequent heating of nanoparticle solutions. A recent series of papers has measured considerable radio frequency (RF) heating of gold nanoparticle solutions. In this work, we show that claims of RF heating by metallic nanoparticles are not supported by theory. We analyze several mechanisms by which nonmagnetic metallic nanoparticles can absorb low frequency radiation, including both classical and quantum effects. We conclude that none of these absorption mechanisms, nor any combination of them, can increase temperatures at the rates recently reported. A recent experiment supports this finding. (36 References).