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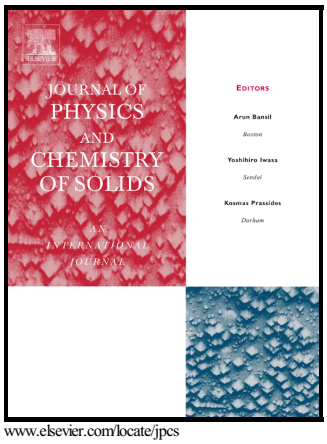

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Radial vibration of ultra-small nanoparticles with surface effects

Jianbiao Wang[a, *)], Yuanwen Gao[1, *)], Ming-Yaw Ng[b] and Yia-Chung Chang[b, c]

[a] Key Laboratory of Mechanics on Environment and Disaster in Western China, The Ministry of Education of China; and Department of Mechanics and Engineering Science, College of Civil Engineering and Mechanics, Lanzhou University, Lanzhou ,Gansu, China

[b] Department of Physics, Cheng Kung University, Tainan 701, Taiwan

[c] Research Centre for Applied Sciences, Academia Sinica, Taipei 11529, Taiwan

Abstract

An elastic model to predict radial vibration of ultra-small nanoparticles is proposed and the main reason of frequency shifts (comparing with classical elastic model) in ultra-small nanoparticles is interpreted. Taking the curvature-dependent surface theory into account, the effects of surface on the radial vibrations of nanoparticles are investigated with our new model. Both the atomic and the present models are calculated and their results agree well. It argues that the surface effects are remarkable on the radial vibrations of ultra-small nanoparticles and surface elasticity plays the main role rather than surface stress which is the previous understanding. The curvature-dependence of surface effects cannot be ignored when the particle is small enough. For the low-order radial vibration, the surface effects are more noteworthy.

Keywords: A: Nanostructures A: Surfaces C: Raman spectroscopy D: Mechanical properties

a) Author to whom correspondence should be addressed. Electronic mail: wangjb2012@lzu.edu.cn; ywgao@lzu.edu.cn .Tel/Fax: +86-931-8914359