



Iranian Journal of Physics Research, Vol. 11, No. 3, 2011

The phonon and thermal properties of a ladder nanostructure

M Mardaani, H Rabani and M Keshavarz

Department of Physics, Faculty of Science, Shahrekord University P. O. Box 115, Shahrekord, Iran
Nanotechnology Research Center, Shahrekord University, 8818634141, Shahrekord, Iran

(Received 30 January 2011 ; in final form 18 July 2011)

Abstract

In this paper, we study the phonon thermal properties of a ladder nanostructure in harmonic approximation. We present a model consisting of two infinite chains with different masses. Then, we investigate the effect of different masses on the phonon spectrum. Moreover, as a specific case, in the absence of the second neighbor interaction, we calculate the phonon density of states/modes. Finally, we consider the thermal conductivity of the system. The results show that the phonon spectrum shifts down to the lower frequencies by increasing the masses. Furthermore, a frequency gap appears in the phonon spectrum. By increasing the springs constants, the thermal conductance decreases.

Keywords: ladder nanostructure; phonon spectrum; density of states/modes; thermal conductance; transfer matrix

For full article, refer to the Persian section