Asymmetric and Anisotropic Heat Transport in Nanostructures

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Manufacturing nanoscale electrical and mechanical devices has motivated deep understanding of heat transport in low dimensional systems, specially for heat management purposes. Specifically, in phonon dominated thermal transport, phonons can be manipulated for controlling heat transport at all temperatures [1]. Thermal rectification is one of the most important cases [2-6]. Here, using molecular dynamics simulations as well as lattice dynamics calculations, asymmetric and anisotropic thermal transport in different 2D and/or layered nanostructures will be discussed. In particular, transport through and across interface, specially in asymmetric layered media [5,7-10], and the important of anisotropy in the structure of 2D systems, e.g. arsenene [10], will be addressed.

References

[1] N. Li, J. Ren, L. Wang, G. Zhang, P. Hanggi, B. Li – Rev. Mod. Phys. 84, 1045 (2012).
[2] B. Li, L. Wang and G. Casati Phys. Rev. Lett. **93**, 184301 (2004).
[3] C W Chang, D Okawa, A Majumdar, and A. Zettl, Science **314**, 1121(2006).
[4] A. Rajabpour, S. M. V. Allaei, and F. Kowsary, Appl. Phys. Lett. **99**, 251901 (2011).
[5] K. Gordiz, S. M. Vaez Allaei, and F. Kowsary, Appl. Phys. Lett. 99, 251901 (2011).
[6] K. Gordiz, and S. M. V. Allaei, J. Appl. Phys. 115, 163512 (2014).
[7] A. Rajabpour, S. M. V. Allaei, Appl. Phys. Lett. **101**, 053115 (2012).
[8] M. Valadkhani, F. Kowsary, D. Donadio, S. M. V. Allaei, unpublished.
[9] A. Rajabpour, Z. Fan, S. M. V. Allaei, submitted.
[10] K Azizi, P. Hirvonen, Z. Fan, A. Harju, K. R. Elder, T. Ala-Nissila, S. M. V. Allaei, submitted.
[11] M Zeraati, S. M. V. Allaei, I. A. Sarsari, M. Pourfath, and D. Donadio, Phys. Rev. B 93, 085424 (2016)