20 Dec Monday 12:00 – 12:45 Chair: YANG Shengyuan (杨声远)

Chiral Phonons: Prediction, Verification and Applications

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Professor ZHANG Lifa got Ph.D degree in Physics in National University of Singapore in Jan 2012, and now is the Dean of School of Physics and Technology, Nanjing Normal University. He has been awarded Jiangsu Distinguished Professor and the leading talent of "Mass Entrepreneurship and Innovation Team" of Jiangsu Province. His research mainly focuses on phonons and quantum thermal transport, includes phonon angular momentum and chiral phonon theory and application, topological phonon/magnon, interface thermal transport, etc. He has published more than 70 papers in leading international journals, including Science, Nat. Phys., Phys. Rev. Lett., Nano Lett., etc. He initiates the annual workshop on thermal transport (WTT2016) in China, and serves as the chairman of the Joint International Conference of Phonons 2018 and PTES2018, etc.

Abstract:

Phonons were traditionally considered as linearly polarized. Recently we predicted that phonons can be chiral and have angular momentum both in magnetic [1] and nonmagnetic systems [2]. The nondegenerate chiral phonons are also predicted and easily tuned in graphene/hexagonal Boron Nitride heterostructures[3]. The chiral phonons were observed monolayer tungsten diselenide, where the phonons chirality is confirmed by the infrared circular dichroism arising from pseudoangular momentum conservation [4]. Our further experiments showed that through the emission of a chiral phonon the momentum-dark intervalley exciton is brightened [5] and chiral phonons can have entanglement with photons [6]. Very recently, we found that the chiral phonons can propagate along high-symmetry axis of 3D materials [7], and will show a diode effect of chiral phonons in chiral systems [8]. We also predicted [9] and observed [10] a chiral-phonon-activated spin-Seebeck effect in chiral materials.

Reference:
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[6] X. Chen, *et. al.,* **Nat. Phys**. 15, 221 (2019).
[7] H. Chen, *et.al*., **Nano Lett. 21**,3060 (2021).
[8] H. Chen, *et.al.* submitted to **Nat. Phys.** (2021)
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