Abstract Submitted
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Experimental Studies of Graphene Antidot Lattices for Thermoelectric Applications[1] QING HAO, DONGCHAO XU, HONGBO ZHAO, Department of Aerospace and Mechanical Engineering, University of Arizona, XU DU, Department of Physics, Stony Brook University — Pristine graphene has low thermoelectric performance due to its ultra-high thermal conductivity and zero band gap that leads to a low Seebeck coefficient (S). Both issues can be addressed by patterning periodic nano- or sub-1-nm pores (antidots) across graphene, called graphene antidot lattices (GALs). In GALs, a geometry-dependent band gap can be opened up to dramatically increase S, with significantly reduced thermal conductivity (k) due to phonon scattering by antidots. Above will lead to a high thermoelectric figure of merit (˜1.0 at 300 K by computations [1]) in GALs to be used for device cooling. Despite numerous calculations, experimental studies of GALs are restricted to electrical conductivity (σ) measurements for GALs with ˜10 nm patterns. The critical k measurements are still lacking. In this work, all three thermoelectric properties (S, k, and σ) are measured on suspended GALs with sub-10 nm pores. In comparison, electrical properties are also characterized for GALs on a substrate. The results presented here provide important guidance on how to tailor transport properties of general two-dimensional materials with ALs. References: [1] Yan et al., Physics Letters A 376, 2425-2429 (2012).

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