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Cross-Plane Thermal Conductivity Measurements of Periodical Nanoporous $In_{0.1}Ga_{0.9}N$ Thin Films DONGCHAO XU, Univ of Arizona, QUAN WANG, Institute of Semiconductors, Chinese Academy of Sciences, XUEWANG WU, JIE ZHU, Univ of Minnesota, HONGBO ZHAO, Univ of Arizona, XIAOJIA WANG, Univ of Minnesota, XIAOLIANG WANG, Institute of Semiconductors, Chinese Academy of Sciences, QING HAO, Univ of Arizona — Nanoporous thin films are expected to reduce lattice thermal conductivity while maintain the bulk-like electrical properties, which can yield a high thermoelectric figure of merit (ZT) [1,2]. For Si thin films, a room-temperature ZT˜0.4 has been reported for 55-nm-pitch nanoporous patterns [3]. Along this line, a high ZT is also anticipated for other nanoporous thin films whose bulk counterparts have superior electrical properties but high lattice thermal conductivities. In this work, the cross-plane thermal conductivities of nanoporous $In_{0.1}Ga_{0.9}N$ thermoelectric thin films [4] with varied porous patterns are measured with the time-domain thermoreflectance technique. In our measurements, a remarkable thermal conductivity reduction has been observed for $In_{0.1}Ga_{0.9}N$ thin films with relatively large sub-micron nanoporous features. Our studies provide guidance for ZT enhancement in nanostructured nitrides and oxides. References: [1] Marconnet et al., Journal of Heat Transfer 135, 061601-1/10 (2013). [2] Cahill et al., Appl. Phys. Rev. 1, 011305 (2014). [3] Tang et al., Nano Lett. 10, 4279-4283 (2010). [4] Lu et al., Semicond. Sci. Technol. 28, 074023 (2013).

Dongchao Xu
Univ of Arizona

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