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Thermal Investigations of Periodically Nanoporous Si Films — The Impact of Structure Sizes and Pore-Edge Amorphization DONGCHAO XU, HONGBO ZHAO, QING HAO, Department of Aerospace and Mechanical Engineering, University of Arizona — In recent years, nanoporous Si films have been intensively studied as promising thermoelectric materials, which mainly benefits from their dramatically reduced lattice thermal conductivity k_L and bulk-like electrical properties.[1,2] Despite many encouraging results, challenges still exist in the theoretical explanation of the observed low k_L.[3] Existing studies mainly attribute the low k_L to 1) phonon bandstructure modification by coherent phonon processes in a periodic structure (phononic effects), and/or 2) pore-edge defects. In this work, temperature-dependent k_L is measured for nanoporous Si films with different pore sizes and spacing to compare with model predictions. For systematic studies, two fabrication techniques are used to drill the nanopores: 1) reactive ion etching, and 2) a focus ion beam to introduce more pore-edge defects. The results from this work will provide guidance for phonon engineering in general materials with periodic interfaces or boundaries. References: 1. Tang et al., *Nano Letters* **10**, 4279-4283 (2010). 2. Yu et al., *Nature Nanotechnology* **5**, 718-721 (2010). 3. Cahill et al., *Applied Physics Reviews* **1**, 011305/1-45 (2014) Nanoscale thermal transport. II. 2003–2012.

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