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Pressure tuning of the thermal conductance of weak interfaces WEN-PIN HSIEH, Stanford Institute for Materials and Energy Science, Stanford University and SLAC, AUSTIN LYONS, ERIC POP, Department of Electrical and Computer Engineering, University of Illinois, Urbana, PAWEL KEBLINSKI, Department of Materials Science and Engineering, Rensselaer Polytechnic Institute, Troy, NY, DAVID CAHILL, Department of Materials Science and Engineering, University of Illinois, Urbana — We use high pressure to reveal the dependence of interfacial heat transport on the stiffness of interfacial bonds. The combination of time-domain thermoreflectance and SiC anvil techniques is used to measure the pressure-dependent thermal conductance G(P) of clean and modified Al/SiC interfaces at pressures as high as P=12 GPa. We create low-stiffness, van der Waals bonded interfaces by transferring a monolayer of graphene onto the SiC surface before depositing the Al film. For such weak interfaces, G(P) initially increases approximately linearly with P, consistent with results of molecular dynamics simulations. At high pressures, P > 8 GPa, the thermal conductance of weak interfaces approaches the high values characteristic of strongly-bonded, clean interfaces. The results provide new insight demonstrating that interface stiffness dominates thermal transport at weak interfaces, but plays a minor role for strong interfaces with stiffness similar to that in the bulk of the materials.

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