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Homoepitaxial Boron Doped Diamond Anvil as Heating Element in a Diamond Anvil Cell JEFFREY MONTGOMERY, GOPI SAMUDRALA, YOGESH VOHRA, University of Alabama at Birmingham — Recent advances in designer-diamond technology have allowed for the use of electrically and thermally conducting homoepitaxially-grown layers of boron-doped diamond (grown at 1200 $^\circ$C with a 2% mixture of CH_4 in H, resulting in extremely high doping levels $\sim 10^{20}/\text{cm}^3$) to be used as heating elements in a diamond anvil cell (DAC). These diamonds allow for precise control of the temperature inside of the diamond anvil itself, particularly when coupled with a cryostat. Furthermore, the unmatched thermally conducting nature of diamond ensures that no significant spatial gradient in temperature occurs across the culet area. Since a thermocouple can easily be attached anywhere on the diamond surface, we can also measure diamond temperatures directly. With two such heaters, one can raise sample temperatures uniformly, or with any desired gradient along the pressure axis while preserving optical access. In our initial experiments with these diamond anvils we report on the measurement of the thermal conductivity of copper-beryllium using a single diamond heater and two thermocouples. We augment these measurements with measurements of sample pressure via ruby fluorescence and electrical resistance of the sample and diamond heater.

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