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Limitations and possibilities of AC calorimetry in diamond anvil cells ZACHARY GEBALLE, UC Berkeley, GILBERT COLINS, LLNL, RAYMOND JEANLOZ, UC Berkeley — Dynamic laser heating or internal resistive heating could allow for the determination of calorimetric properties of samples that are held statically at high pressure. However, the highly non-adiabatic environment of high-pressure cells presents several challenges. Here, we quantify the errors in AC calorimetry measurements using laser heating or internal resistive heating inside diamond anvil cells, summarize the equipment requirements of supplying sufficient power modulated at a high enough frequency to measure specific heats and latent heats of phase transitions, and propose two new experiments in internally-heated diamond anvil cells: an absolute measurement of specific heat (with $\sim 10\%$ uncertainty) of non-magnetic metals using resistive heating at ~ 10 MHz, and a relative measurement to detect changes in either the specific heat of metals or in the effusivity (the product of specific heat, density and thermal conductivity) of an insulator.

Zachary Geballe
UC Berkeley

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