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Abstract for an Invited Paper
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High Accuracy Equations of State: Status and Requirements for Theory

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I will discuss high accuracy equations of state in connection with two applications of current interest. The first is the development of accurate standards. Standards, whose off-Hugoniot EOS are known, are needed as pressure indicators in static compression experiments, and are useful for benchmarking new techniques, such as isentropic compression. Recent studies show inconsistencies among the shock-based standards that contribute significantly to the errors in static EOS measurements. The second area of interest are materials undergoing phase changes. High accuracy equilibrium EOS are needed in this case in order to infer non-equilibrium behavior from time-resolved shock data. I will discuss the accuracy requirements driven by these applications in terms of the static lattice and thermal contributions to the free energy. I will critically assess the status of ab initio methods with respect to these requirements. These considerations will be illustrated with recent work on the EOS of Au, Cu, Pt, Zr and Sn.