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Uncertainties in the Shock Devolatilization of Hydrated Minerals SARAH STEWART, RICHARD KRAUS, Harvard University, RALPH MILLIKEN, University of Notre Dame, NICHOLAS TOSCA, University of Cambridge
— Controlled recovery of hydrated minerals subjected to planar shock loading is challenging because of the large volume required for equilibrium outgassing upon shock release. Significant differences in recovery capsule design confound straightforward interpretation of existing data on shock modification of hydrated minerals. We present results from new experiments on nontronite (a smectite clay observed on Mars) and identify major issues in the interpretation of recovered samples. Most previous work assumes that the first shock pressure step in a ring-up configuration is the most important factor in the interpretation of shock modification. By comparing experiments with similar first shock steps but different final shock states, this work demonstrates the need for a deeper understanding of the thermodynamics of ring-up experiments in order to be able to interpret the results in terms of an equivalent single shock loading pressure for planetary applications. At high shock pressures, vented capsules are essential in order to characterize the structural alteration upon shock release. We have developed a recovery method and validation test that allows us to address the major issues and technical tradeoffs with shock recovery experiments on volatile materials.

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