Abstract Submitted
for the SHOCK13 Meeting of
The American Physical Society

Shock Thermodynamics of Mantle Rocks: Rockport Fayalite
SARAH STEWART, WILLIAM STEINHARDT, Harvard University — In order to address questions related to giant impacts and impact cratering on terrestrial planets, we need robust equations of state (EOS) and thermodynamic data for major mantle minerals (e.g., the olivine series and enstatite) and rocks under a wide range of pressure-temperature conditions. It is important to accurately characterize the amount of impact-induced heating that occurs in order to understand a range of planetary problems, including the mechanics of basin formation, the formation of the Martian crustal dichotomy, the origin of Earth's moon, and the depths of magma oceans on the early Earth during accretion. The long-term goal of this work is to develop comprehensive EOS for the most important mantle minerals for use in impact modeling and to understand the heterogeneous distribution of shock and post-shock temperatures in rocks. Here we present the results from new post-shock temperature experiments on fine-grained Rockport fayalite rock and comparisons to previous post-shock measurements on rocks and minerals. Multi-band pyrometry data indicate that the post-shock temperature field is very heterogeneous in Rockport fayalite. We observe multi-wave shock profiles with VISAR in the mixed-phase region on the Hugoniot, which have not been previously recognized.

William Steinhardt
Harvard University

Date submitted: 25 Feb 2013 Electronic form version 1.4