

**Extreme Planetary Systems – NASA GRC
Current and New Capabilities to Study the
Thermochemistry and Kinetics of
Materials, Minerals and Gases/Vapors**

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The physiochemical properties and processes of materials and minerals under extreme temperature and pressure conditions in harsh chemical environments are a current and future concern of understanding their stability in energy, defense, deep mining, planetary and space exploration applications. Some examples of these environments include the lower atmosphere and surface of Venus, the atmospheres of Hot Rocky Planets, the combustor chamber of jet engines and the ionization chamber of Hall Thrusters. Knowledge gained on these properties and processes have important implications for construction materials of future planetary probes and for aerospace propulsion vehicles besides helping us to better understand the history and present day state of inhospitable and even inaccessible regions of the Earth as well as other solar or extrasolar planets. This presentation provides an overview of the calorimetric and spectrometric capabilities of the NASA GRC Experimental Thermodynamic Laboratory to measure the integral and partial thermodynamic properties of minerals, materials and gases/vapors, and the features and characteristics of the unique Glenn Extreme Environment Rig (GEER) which is capable of accurately reproducing the atmospheric chemical compositions of bodies in the solar system including those with acidic and hazardous elements of the Venus lower atmosphere. It also covers some recent experimental results.