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Laser shock compression experiments for precompressed Methane in Mbar regime

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The properties of methane at high density and temperature are of crucial interest for understanding the interiors of many giant planets, and the origin of their strong magnetic fields, as CH4 is typically considered to represent 25 % of the planet's icy layer. Methane is a hydrogen-rich molecular material that is expected to dissociate at high pressure and temperature into an electrically conductive fluid.

We used static and dynamic coupling compression technique to generate icy planets core conditions in laboratory.
Methane was precompressed to ˜0.4 GPa by DAC and then was shock compressed dynamically to pressures of more than 100 GPa.
We simultaneously measured pressure, density, temperature, and optical reflectivity for the highly compressed methane with velocity interferometers (VISAR) and optical pyrometer (SOP).

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Keywords: High-Power Laser, static and dynamic coupling compression, Methane, DAC