$V(P)$ equations of state of novel lanthanum and yttrium superhydrides

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Metal hydrides are important materials for hydrogen and energy storage applications. High pressure is a very effective tool for the synthesis of new hydrogen-rich compounds, because it dramatically increases the Gibbs free energy of molecular hydrogen, stabilizing hydrides against decomposition into constituents.

Superhydrides, which are a class of recently discovered hydrogen-rich compounds with H/M>4, demonstrate properties characteristic of atomic metallic hydrogen. Particularly, superconductivity with critical temperatures reaching 250 K in the La-H [1, 2] and 243 K in the Y-H [3, 4] systems was observed recently.

Presently, we discuss the $V(P)$ equations of state of various lanthanum and yttrium superhydrides in the pressure ranges 120-163 and 160-255 GPa, respectively, studied with X-ray powder diffraction in diamond anvil cells at the 13-IDD beamline at GSECARS, Advanced Photon Source, Argonne National Laboratory.

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