

Syntheses of various metal hydrides and oxides at high-pressure and high-temperature conditions in diamond anvil cells and the structure determinations

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The researches on synthesis of novel materials under high pressure conditions are long time hot topics. Many metal hydrides were predicted by the first principle calculations for potential multiple stable phases within the wide range of high pressure region, and interesting behaviors, such as high T_c superconductivity, were reported in last decade, but not fully understood. In this presentation, several typical cases would be introduced, including the potentially multiple phases syntheses from complicated reactions during *in situ* laser heating process in diamond anvil cell (DAC) under high-P (over 100 GPa) and high-T (2,000 – 3,000 K) conditions, and then the major phases in DAC were *in situ* investigated under high pressure using lab base and synchrotron x-ray diffraction (XRD) techniques at high temperature, ambient temperature and low temperature conditions. Selected cases, such as metal hydrides (Ca-H, Lu-H, Hf-H), and interesting oxides such as LaNiO and BaKBiO systems, would be discussed based on the recent XRD results, solving novel phases and the first principle calculations, and then propose the possible general trend for their phase diagrams at low temperature and high pressure region.

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