

Melting of transition metal-hydrogen systems under high pressure

KATAYAMA, Yoshinori^{1*}, Hiroyuki Saitoh¹, Katsutoshi Aoki¹

¹QuBS, Japan Atomic Energy Agency

Hydrogen reacts with many kinds of metals and forms metal hydrides. Early transition metals such as Ti and V form hydrides while solubility of hydrogen in other transition metals such as Fe and Ni is low at ambient pressure. However, Fe and Ni absorb hydrogen under high pressure conditions. To study liquid state of transition metal-hydrogen systems, we have performed x-ray diffraction measurements under high-pressure high-temperature conditions for Ti, V, Mn, Fe, Co and Ni.

Experiments were performed using a cubic-type multi-anvil press installed on BL14B1 at SPring-8. Stating materials are TiH₂ and VH₂ for Ti and V, and pure metals for Mn, Fe, Co and Ni. It was inserted in a high pressure assembly together with hydrogen source. A NaCl capsule was used to keep hydrogen. The sample was heated at about 4 GPa. We did not observed clear melting for TiH₂ and VH₂ while we measured x-ray diffraction of liquid transition-hydrogen alloy for Mn, Fe, Co and Ni. The results showed that the nearest distance between metal atoms elongated by hydrogenation.

This work is partly supported by NEDO under "Advanced Fundamental Research on Hydrogen Storage Materials"

[1] Y. Fukai, Butsuri, 55 (2000) 685(in Japanese).

[2] Y. Katayama, et al., J. Phys.: Conf. Ser., 215 (2010) 012080.

Keywords: High Pressure, Hydrogen, Metal, Liquid, X-ray Diffraction, Structure