

## Effect of sulfur on the reaction between iron and water under high pressure and temperature

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It is reported that hydride phase such as FeH and FeOOH appears by a reaction between Fe and H<sub>2</sub>O under the Earth's deep environment during the formation stage (e.g., Okuchi, 1997; Ohtani et al., 2005). In this study, we added sulfur and observed a reaction of the Fe-S-O-H system under high pressure and high temperature to investigate the effect of sulfur on Fe-O-H system.

Because hydrogen in metal hydride, which is expected to produce in the reaction, is dissipated from the sample at low pressure, we carried out the experiments at High Energy Accelerator Research Organization (KEK), Photon factory (PF-AR-NE1A), and identified phase transitions of the sample and the reaction products by in situ X-ray diffraction method.

We used a laser-heated diamond anvil cell installed at AR-NE1 to generate high pressure and high temperature. Starting materials were pelleted FeS and pure water in rhenium gasket. The pressure was measured using the equation of state of ice VII. The double-sided heating with Nd:YAG laser to heat, the reaction temperature was estimated from radiation of the high temperature portion of the sample.

In this study, the pressure was 24 and 33 GPa and the temperature was between 300 and 1200 K. As a result, FeS<sub>2</sub> (Pyrite), dhcp-FeH<sub>x</sub> and  $\epsilon$ -FeOOH appeared as the reaction product. It was revealed that stability field of  $\epsilon$ -FeOOH is much higher pressure than that of Fe-O-H system, high temperature decomposition of  $\epsilon$ -FeOOH was also constrained, FeS<sub>2</sub> which doesn't appear in the Fe-S-H system is observed. We will present further result of SEM-EDS analysis of the recovery sample.

Keywords: Earth's core, light element, hydrogen, synchrotron