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高圧下における液体 Fe-C 合金の音速測定
Sound velocity measurements of liquid Fe-C alloy under high pressure

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The liquid Earth's outer core consists predominantly of iron with c.a. 10 wt.% lighter elements, such as hydrogen, carbon, oxygen, silicon, and sulfur. Other terrestrial planets such as Mars, Mercury and Venus are also similar to the Earth in that they have a central metallic core, which are considered to be at least partially molten. Popular models for those planetary cores also favor the existence of lighter elements. The nature of the light elements is important for understanding the acient core formation processes and the present core structure and dynamics in terrestrial planets, which are still not well understood. The seismic wave speed is the primary information on the Earth's core. The sound velocity of liquid Fe alloying with light-elements is therefore key to constrain the lighter component in the Earth's core and will be referenced for the future survey of other planets. Recently we have developed the techniques for inelastic X-ray scattering (IXS) measurements combined with diamond-anvil cell (DAC) experiments at the SPring-8 synchrotron facility, in order to investigate sound velocities of liquid Fe alloying with light-elements under high pressure and high temperature conditions relevant to planetary cores. We determined sound velocities of liquid Fe-C alloy up to 70 GPa. We will discuss the effect of carbon on sound velocity of liquid iron and on planetary cores.
Keywords: sound velocity, light element in the core, liquid iron carbide, high pressure