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# Sound velocity and density measurement of liquid FeSi alloy by laser-shock compression

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The internal structure of the earth is estimated by observing seismic wave. Comparing seismic wave observations and experimental data of sound velocity of iron(Fe), the composition of the Earth's core is not pure Fe. Several light elements (hydrogen, carbon, oxygen, silicon, sulphur, etc.) have been considered as the candidate of the composition of the Earth's core, but its composition is still unclear. In order to constrain the core composition, it is important to measure the sound velocity of iron alloys because it can be directly compared with the seismic wave. Silicon (Si) has been proposed as a major light element in the inner core [Mao et al., 2012]. So we measured the sound velocity of laser-shocked FeSi alloy in order to investigate the effect of Si for sound velocity of liquid Fe in the outer core condition.

The starting sample was prepared by synthesizing from mixture of Fe (99.98% purity) and Si (99.9% purity) slugs at arc furnace. The compositions of Fe and Si are 66.5 wt.% and 33.5 wt.%, respectively. We measured sound velocities and densities of FeSi at high pressure and high temperature conditions at the large laser facility in Institute of Laser Engineering, Osaka University. The sound velocities were measured by the x-ray radiography [Shigemori et al., 2012].

We obtained the sound velocity and density of FeSi at pressures around 700 GPa. It is seen that Si has the effect of increasing the sound velocity of liquid Fe. Comparing our experimental results and PREM model [Dziewonski and Anderson, 1981], Si may be contained up to 13.1 wt.% at 135 GPa, and up to 5.5 wt.% at 330 GPa in the outer core.