

Sound velocities of laser-shocked Fe-Ni alloys under Earth core conditions

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When we consider the structure of Earth's interior, the sound velocity is one of the important physical properties of the interior materials because it can be directly compared with the seismological data (1) which can yield the physical properties of the Earth's interior. Cosmochemical data and the composition of iron meteorites suggest that Earth's core contains mainly Fe-Ni alloy with 5-25 wt.% Ni. Although Lin et al. (2) and Kantor et al. (3) measured compressional sound velocities of Fe-Ni alloys at room temperature by inelastic x-ray scattering (IXS) at diamond anvil cell (DAC), the sound velocity data of liquid Fe-Ni alloys is very few (4).

We performed laser-shock experiments of liquid Fe-Ni alloys at HIPER system of Gekko-XII laser in Institute of Laser Engineering, Osaka University (5). Sound velocities were measured by side-on radiography (6, 7). We obtained sound velocities of Fe-Ni alloys at pressures up to 770 GPa. The sound velocity of Fe-Ni alloy was about 10% lower than that of liquid Fe at inner core boundary (ICB) pressure.

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