Sound velocity of iron-nickel alloys determined by femtosecond acoustic measurement in diamond anvil cell

*若松 達也[1]、太田 健二[1]、廣瀬 敬[2]、八木 貴志[3]
*Tatsuya Wakamatsu[1], Kenji Ohta[1], Kei Hirose[2], Takashi Yagi[3]

1. 東京工業大学地球惑星科学系、2. 東京工業大学地球生命研究所、3. 国立研究開発法人産業技術総合研究所
1. Department of Earth and Planetary Sciences, Tokyo Institute of Technology, 2. Earth Life Science Institute, Tokyo Institute of Technology, 3. National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology,

Iron-nickel (Fe-Ni) alloy is believed to be a major component of the Earth's core based on the cosmochemical models and the studies of iron meteorites, although accurate chemical composition of the Earth’s core is still unknown. Comparison between seismic wave velocity profile in the Earth and laboratory data of sound velocity of Fe alloys enables us to decipher chemical composition and comprising minerals there. Acoustic velocity of $Fe_{0.92}Ni_{0.08}$ has been obtained from nuclear resonant inelastic x-ray scattering (Lin et al., 2003), while experimental study on sound velocity of Fe-Ni alloy has not been performed in a wide range of nickel content. Here we measured longitudinal wave velocities of Fe, $Fe_{0.95}Ni_{0.05}$ and $Fe_{0.85}Ni_{0.15}$ up to 61 GPa and 300 K by means of a femtosecond acoustic technique in a diamond anvil cell (Decremps et al., 2014). The obtained sound velocity of Fe is in good agreement with previous studies. We also found that the acoustic velocities of iron-nickel alloys are slightly lower than that of pure iron.

Reference
Lin, J. *et al.* Iron Nickel alloy in the Earth’s core. *Geophys Res Lett* **29,**(2002).
Decremps, F. *et al.* Sound velocity of iron up to 152 GPa by picosecond acoustics in diamond anvil cell. *Geophys Res Lett* **41,** (2014).

キーワード：コア、音速、鉄ニッケル合金、高圧
Keywords: core, sound velocity, iron-nickel alloy, high pressure

