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Sound velocity of liquid FeS alloy in diamond-anvil cell via inelastic X-ray scattering measurements SAORI KAWAGUCHI, Japan Synch Rad Res Inst (JASRI), YOICHI NAKAJIMA, Kumamoto Univ., KEI HIROSE, Tokyo Inst of Tech, TETSUYA KOMABAYASHI, Univ. of Edinburgh, HARUKA TATENO, Tokyo Inst of Tech, SHIGEHIKO TATENO, Okayama Univ., YASUHIRO KUWAYAMA, Ehime Univ., GUILLAUME MORARD, Univ. Pierre et Marie Curie, HIROSHI UCHIYAMA, SATOSHI TSUTSUI, JASRI, ALFRED BARON, RIKEN — We have developed a new method and investigated sound velocity of liquid Fe-Ni-S alloys at high pressure up to 52 GPa in both externally-resistance-heated and laser-heated diamond-anvil cells using high-resolution inelastic X-ray scattering measurements (IXS) at SPring-8 with energy resolution of 2.8 meV at 17.79 keV. The X-ray beam was focused to 17 μm^2 area by a KB focusing mirror optics. At each P-T condition, IXS spectra were collected at different momentum transfers (Q) using an array of twelve independent analyzers. The Q range was 3.2 - 6.6 nm^{-1} with resolution of 0.4 nm^{-1} full width. Each spectrum was obtained in an energy range of -30 to 40 meV. Melting of the sample was determined by angle-dispersive X-ray diffraction spectra obtained before IXS measurements. We determined the elastic parameters of liquid $Fe_{47}Ni_{28}S_{25}$ to be $K_{SO} = 95.3$ (27) GPa and $K_{SO} = 3.98$ (13), where K_{SO} and K_{SO} are the adiabatic bulk modulus and its pressure derivative at zero pressure, when fixing the density at 5.58 g/cm^3 for 1 bar and 2000 K. Both sound velocity and density observed for the Earth's outer core can be explained by adding 5.8-7.0 wt. percent sulfur in the liquid iron.

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