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A new view of the Inner Core from the primary pressure scale derived from synchrotron X-ray study at high pressure

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Establishing pressure scale has been a subject of intensive research but still involves significant extrapolation and approximations, especially under the inner core conditions. In order to solve the problem, we developed techniques to measure the sound velocity at high pressure with using Inelastic X-ray scattering (IXS). We developed a primary pressure scale extending to the multi-Megabar pressures of the Earth's core by measuring compressional velocity, shear velocity, and density of rhenium with using synchrotron IXS and XRD. Our new pressure scale agrees with previous primary scales below 100 GPa and also shock compression experiments, but it is significantly different from previous secondary pressure scales at Earth's core pressures: previous scales have overestimated, by at least 20%, laboratory pressures at 230 GPa. Our new pressure scale suggests the density deficit of the inner core is doubling the light-element contents [1].

This abstract is one of contributions from Commission of Physics of Minerals (CPM), International Mineralogical Association (IMA).

Reference:

[1] Ikuta et al. (2023) Science Advances 9, eadh8706

Primary author: OHTANI, Eiji (Tohoku University)

Presenter: OHTANI, Eiji (Tohoku University)

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