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Fe_2O_3 post-perovskite as a candidate phase for ultralow-velocity zones

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The core–mantle boundary is the most fundamental chemical discontinuity in the Earth. Recent experiments showed that, when water meets iron at the core-mantle boundary, hydrogen-bearing iron peroxide FeO_2H_x can be produced, which then decomposes to Fe_2O_3 post-perovskite and fluids due to a steep temperature gradient at the core–mantle boundary regions. Therefore, post-perovskite Fe_2O_3 is one of the most plausible compounds at the core–mantle boundary. Here, for the first time, we measured experimentally the sound velocity of post-perovskite Fe_2O_3 through inelastic x-ray scattering. Combined with first-principles investigations, we show that Fe_2O_3 post-perovskite has very low sound velocities and strong anisotropy with respect to lower-mantle silicates. Therefore, Fe_2O_3 post-perovskite is a candidate phase for ultralow-velocity zones at the core–mantle boundary.

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