

Single-crystal elastic property of bridgmanite and seismic anomalies in the lower mantle

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Single crystal elasticity of bridgmanite is essential information to understand the seismic velocity structure of the lower mantle from the viewpoint of chemical and thermal structures. We have performed inelastic x-ray scattering measurement at BL35XU of SPring-8 on 100-micron size (Mg,Fe,Al)(Si,Al)O₃ single crystals synthesized by thermal gradient method. Analysis of the obtained spectra gives single crystal elastic stiffness constants. The cation substitution is seen to cause the anti-correlation between the bulk sound and shear wave velocities as well as to enhance the elastic anisotropy of bridgmanite, and consequently allows us to make a quantitative model that is consistent with seismological observations.

Keywords: bridgmanite, inelastic x-ray scattering, single crystal elasticity, cation substitution, lower mantle, seismic anomaly