

The 16th Global-COE (32nd GRC) International Frontier Seminar

February 9th, 2010, from 17:00, at the meeting room 6F

Effect of spin transitions on properties and dynamics of the lower mantle

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Comparison of laboratory measurements of sound and shear wave velocities of mantle minerals with seismic data constitutes one of the foundations upon which knowledge of the Earth's interior is based. In situ measurements are important, because some transitions (for example, spin transitions) are not quenchable, and may influence the elastic properties of iron-containing minerals. Nuclear inelastic scattering (NIS) offers the possibility to determine bulk sound velocities of iron-containing minerals in the diamond anvil cell through direct measurement of the partial density of states. Both dominant lower mantle phases, silicate perovskite and ferropericlase, have been reported to undergo spin transitions at pressure and temperature conditions of the Earth's lower mantle, although their nature remains controversial. The resulting uncertainty regarding their influence on mantle properties is bypassed, however, by making direct bulk sound velocity measurements at high pressure and temperature that can be compared with seismic data. Using a newly developed approach, we performed NIS measurements on iron-bearing silicate perovskite and ferropericlase in laser-heated diamond anvil cells, coupled with nuclear forward scattering to determine spin populations and X-ray diffraction to observe crystal structures. I will present our most recent results, and discuss their implications for modelling of lower mantle compositions and temperatures as well as consequences for dynamic mantle processes.

9 February 2010 17:00-18:00
Science Research Building 1
6F Meeting room
Ehime University



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