Shear deformation experiments on (Mg,Fe)O

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Large strain, shear deformation experiments were performed on (Mg1-x,Fex)O (x=0.25, 1.0), one of the important minerals in Earth's lower mantle. Deformation experiments were made on coarse-grained (15-20 micron meter in grain-size) hot-pressed aggregates at conditions of T/Tm˜0.46-0.65 (T: temperature, Tm: melting temperature) up to the shear strain of ˜7.8. Under these conditions deformation occurs by dislocation creep. The microstructural development in (Mg,Fe)O is found to be sluggish and the complete dynamic recrystallization and nearly steady-state fabric (lattice preferred orientation) are achieved only after shear strains of 4. At nearly steady-state, (Mg,Fe)O shows strong fabrics characterized by the 110 axes being parallel to the shear direction and the poles of the {100} planes (and to a lesser extent the poles of the {111} planes) normal to the shear plane. This fabric is markedly different from that of a structural analog material, NaCl, where the poles of the {110} planes show strong maximum normal to the shear plane. The seismic anisotropy corresponding to the deformation fabrics in (Mg,Fe)O was calculated. We will discuss on the anisotropy of core-mantle boundary layer.