American Mineralogist, Volume 96, pages 1630–1635, 2011

The development of shape- and crystallographic-preferred orientation in $CaPtO_3$ post-perovskite deformed in pure shear

Richard McCormack,[1] David P. Dobson,[1,*] Nicolas P. Walte,[2] Nobuyoshi Miyajima,[2] Takashi Taniguchi,[3] and Ian G. Wood[1]

[1]Department of Earth Sciences, University College London, Gower Street, London WC1E 6BT, U.K.
[2]Bayerisches Geoinstitut, Universität Bayreuth, D-95440 Bayreuth, Germany
[3]National Institute for Materials Science, Tsukuba, Ibaraki 305-0044, Japan

Abstract

Knowledge of the deformation mechanism of post-perovskite is important for interpreting observed seismic anisotropy in terms of mantle flow. Experiments on post-perovskite $MgSiO_3$ and the low-pressure analog material $CaIrO_3$ yield different textures, leaving the interpretation of the observed seismic signatures unclear. Here we present results of deformation experiments on $CaPtO_3$ post-perovskite that may be a better analog to $MgSiO_3$. Post-perovskite $CaPtO_3$ deforms by glide of [100] dislocations on the (010) plane, consistent with previous experimental results on $CaIrO_3$. In addition, samples containing a weak minority phase also display shape-preferred orientation with grains elongated in the crystallographic *a*-direction forming a planar fabric perpendicular to the compression direction. This shape-preferred orientation strengthens the observed crystallographic-preferred orientation and results in a rapid development of texture during deformation. This observation supports the recent suggestion that the D″ reflector might be due to a rapid generation of texture in post-perovskite. Furthermore, the role of shape-preferred orientation in generating seismic anisotropy in multi-phase assemblages should be considered for the D″ assemblage.

Keywords: $CaPtO_3$, post-perovskite, deformation mechanism, shape-preferred orientation, crystallographic-preferred orientation, seismic anisotropy