Mineral and Rock Physics [MR]

MR21B MCW:Level 1 Tuesday 0800h

Structural Refinement Studies for Minerals Under High-Pressure Conditions Posters

Presiding: H Liu, Carnegie Institution of Washington; M Kunz, Advanced Light Source

MR21B-0018

The Crystal Structure of Diopside at Pressure to 10 Gpa

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Understanding the compression mechanisms of mantle minerals is important to predicting their behavior and properties beyond the range of conditions available in the laboratory. High-pressure experimental studies of C2/c pyroxenes have variously focused on different structural changes such as bond length changes, relative compression of different polyhedral components, and changes in the d-spacings of eutactic planes of oxygens. Recently, Thompson and Downs (2004) modeled the crystal structures of pyroxenes with regular tetrahedra and M1 octahedra to try and understand the observed changes in pyroxenes with changing P, T, and x. In this paper, we present new refinements of the crystal structure of diopside to 10.16 GPa, and analyze them using our model. A new parameter has been derived which quantifies the distortion of a C2/c pyroxene from its model equivalent (i.e. same unit cell volume and O3-O3-O3 angle, regular M1 and T), and this parameter is used to compare model and observed compression. Model and observed unit strain ellipsoids are compared. Compression mechanisms explored by previous investigators are placed in the context of our model. The data of Levien and Prewitt (1981) to 5 GPa is shown to be statistically consistent with our data. Thompson, R.M., and Downs, R.T. (2004) Model pyroxenes II: Structural variation as a function of tetrahedral rotation. American Mineralogist 89, 614-628. Levien, L. and Prewitt, C.T. (1981) High-pressure structural study of diopside. American Mineralogist, 66, 315- 323.