

Interdiffusion in the Presence of Free Convection

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Abstract

Because of their technological importance, establishment of the precise values of interdiffusion coefficients is important in multicomponent fluid systems. Precise values are not available because diffusion is influenced by the presence of free convection due to compositionally induced density variations. In this project, earth-based diffusion experiments are being performed in a viscous fluid system PbO-SiO_2 at temperatures between 500 - 1000 °C. This system is chosen because it shows a large variation in density with small changes in composition and is expected to show a large free convection effect. Infinite diffusion couples at different temperatures and times are being studied with different orientations of the gravity direction with respect to the diffusion direction. Three dimensional composition profiles will be measured using an Electron Microprobe Analyzer and will be compared with the results of a complementary modeling study to extract the values of the true diffusion coefficient from the measured diffusion profiles.