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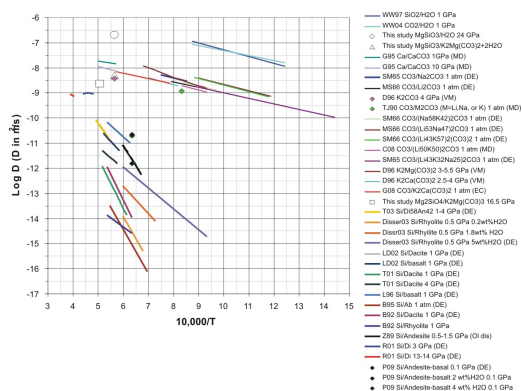
Diffusion of silicates in alkali carbonate melt and water fluid, experimental study at 17-24 GPa and 1400-1750°C

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There are much direct and indirect evidences of carbonatitic and hydrous melt/fluid segregation in the deep mantle in the past Earth's history. One particular example is the source regions of carbonatites, kimberlites, and lamproites some of which originate from more than 250 km depth. Another example is the natural diamond forming medium which most probably was extremely enriched in water, carbonates, and alkalis. Despite of that, the average mantle concentrations of carbon and hydrogen do not exceed 100 and 120 wt ppm respectively, the volatile segregation in a broad mantle region should be involved to explain the local abundance of CO₂ and/or H₂O. Enrichment of these fluids in incompatible trace elements (specifically, K, Rb, Sr, Ba, light REE, Ti, Nb, Zr, P, U, and Th) also implies their long infiltration history through the large volumes of mantle rocks.

The probable mechanism of the fluid segregation in the deep mantle is the dissolution-precipitation mechanism. The rate of fluid segregation by this mechanism is proportional to the diffusion coefficient of silicate components in the fluid. Here we would like to present our current results on study of silicate diffusion in the K₂Mg(CO₃)₂, K₂Mg(CO₃)₂·2H₂O, and H₂O. The summary of obtained data is shown in the figure below along with available literature data on diffusion in the silicate and carbonate melts and water fluid.



Keywords: mantle, diffusion, carbonate, water fluid