Experimental modeling of eclogite and C-O-H fluid interaction in the subduction zones

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The presence of volatile components controls melting relationships in the subducting oceanic plate and the overlying mantle wedge, affecting their physical properties and seismic observables. The major volatile species in the mantle low oxygen fugacity environment are considered to be H_2O and CH_4, as estimated for mantle xenoliths and C-O-H fluid speciation in equilibrium with diamond [1,2]. Experimental studies with the direct monitoring of phase assemblages and melting relationships in the silicate systems with C-O-H components can shed light on the processes, which take place in the subduction zones, and provide important data for interpretation of observed physical parameters.
In this study, we employed *in situ* spectroscopic methods in combination with the diamond anvil cell (DAC) technique for investigation of C-O-H fluid behavior and its influence on phase relationships in the eclogite–$5.75H_2O$–CH_4 system at temperatures up to 1000 degree C and pressures exceeding 5 GPa. We designed a new cell assembly for Mao-type symmetric diamond anvil cell with large optical access to the sample in order to make it suitable for infrared and Raman measurements directly at high-pressure and high-temperature conditions. Mineral phase assemblages, observed during experiments, are consistent with those described in the dry system of the similar basaltic composition [3]. At the same time, miscibility between aqueous and carbonaceous components in the fluid phase coexisting with silicate minerals was confirmed at temperatures above 800 degree C and pressures above 3.2 GPa.

References

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