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Experimental modeling of subduction zone metamorphism and devolatilization

Alexei L. Perchuk (1,2,3) and Olga S. Korepanova (2)

(1) Department of Petrology, Geological Faculty, Moscow State University, Moscow, 119992, Russia (alp@geol.msu.ru, +7 4959328889), (2) Institute of Experimental Mineralogy, Russian Academy of Sciences, Chernogolovka, Russia , (3) IGEM, Russian Academy of Sciences, Moscow, Russia

Subduction zones are characterized by valuable thermal gradients owing to descend of cold oceanic plate into the hot mantle. We propose for the first time to apply high-gradient zones of the piston-cylinder apparatus to study the interaction between subducting plate and hanging wall mantle. In this contribution, we present peculiar features of the glaucophane schist-olivine interaction as analogs of crust and mantle, respectively. The glaucophane schist is from the Atbashi complex, Tien Shan, the olivine is collected from the quarry Ahaim, Norway. - conditions of the runs correspond to so-called "warm" geotherm. We present results of the two runs carried out at pressure of 2.4 and 2.6 GPa and both at the temperature of 1050 grad at the upper range of the capsule. Temperature of $\sim$700 grad C the lower edge of the 7 mm capsule was inferred from the numerical modeling based on the real sizes of materials after the runs.

The experiments reveal that transformation of the glaucophane schist is strongly controlled by the pressure. The transformation was resulted in growth of barroisitic amphibole rims around the primary glaucophane at 2.4 GPa and patchy omphacite+quartz aggregate at 2.6 GPa. Thus we didn't observe the typical eclogite assemblage (omphacite+garnet) in the metabasic rock well within the eclogite facies P-T conditions. The devolatalization owing to the breakdown of hydrous mineral of the glaucophane schist lead to the formation of thin (30 micron) orthopyroxene layer at the contact of olive with glaucophane schist. In addition, first portions of melt (dacite composition) appear in between the orthopyroxene layer and the glaucophane schist. The melt (fluid) was migrated above the opx layer but owing to the low Si-content didn't react with the host olivine. The study demonstrated that high-gradient zones of the "piston-cylinder" apparatus are very efficient for study mantle-crust interaction in the subduction zones.

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