High water content in omphacite: Evidence from Yakutian corundum-bearing eclogites

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Four new eclogite xenoliths from the Obnazhennaya kimberlite, Yakutia, show lamellar or lense-shaped exsolution-like grains of grossular associated with zoisite and scarce amphibole along the cleavage planes of the host omphacite. Compositionally and texturally, the samples are related to group B and to type II unmetasomatized eclogites. Major element compositional profiles show intragranular chemical gradients towards the unmixed phases indicating formation in an isochemical system controlled by intramineral difussion. There is no evidence for interaction with a percolating melt, the exsolved hydrous phases thus may have unmixed from the initial clinopyroxene. Equilibrium temperatures are 950°-1100°C at pressures of 4-4.7 GPa from the Fe-Mg exchange thermometer and the local conductive geotherm. [1], show that zoisite can be stable up to 7 GPa and 1000°C in H_2O- and Al_2O_3- saturated environments. At higher pressures and temperatures multi-equilibrium calculations become uncertain because of a lack of an accurate experimental data for omphacite. FTIR OH measurements within individual, homogenous omphacite grains yield 1700-2500 ppm, proportional to the degree of unmixing. We infer that the amount of water that can be stored in clinopyroxene at mantle conditions is higher than measured in the cpx from our samples, thus explaining the exsolution textures. The new data show that a significant amount of water can be stored in the mantle in clinopyroxenes but the calculated values should be used only as a reference due to the lack of accurate absorption coefficients and a calibration standard for omphacite.

[1] Poli & Schmidt (1998), *Contrib. to Mineral Petrology* **130**, 162-175.