European Mineralogical Conference
Vol. 1, EMC2012-492, 2012
European Mineralogical Conference 2012
© Author(s) 2012

Carbonatites out of a subducted altered oceanic crust? New experimental evidences for "low-temperature" carbonatitic melts in COH-bearing gabbros at 3.8 – 4.2 GPa

S. Poli

Università degli Studi di Milano, Dipartimento di Scienze della Terra, Milano, Italy (Stefano.Poli@unimi.it)

Current knowledge on the solidus temperature for carbonate-bearing rocks suggests that carbonatitic magmas should not occur in subduction settings, unless unusually hot conditions are attained at depth or unless thermal relaxation is promoted by a variety of possible tectonic scenarios (plumes, subduction termination, etc.). For a mildly warm subduction path, the COH-bearing altered basaltic oceanic crust is expected to loose all H_2O component at epidote breakdown, located at approximately 2.8-3.0 GPa. Above this pressure limit, the solidus of a basaltic eclogite, bearing carbonates inherited from the ocean floor metamorphism, has a minimum temperature of approx. 1020 ˚C at 4.0-4.5 GPa (Dasgupta et al. 2004). However, the oceanic crust includes a range of gabbroic rocks, altered on rifts and transforms, from norites to troctolites with plagioclase abundances from 50% to 80% in volume. It has been shown that epidote disappearance with pressure depends on the normative anorthite content (*An*) of the bulk composition considered (Poli & Schmidt, 2004), we therefore expect that altered gabbros might display a much wider pressure range where epidote affects solidus relationships.

New experimental data at 3.8 and 4.2 GPa are intended to unravel the effect of variable bulk and volatile compositions in two model eclogites in the chemical system Na_2O-CaO-FeO-MgO-Al_2O_3-SiO_2-C-O-H, enriched in the normative anorthite component (*An*37 and *An*45). Experiments are performed in piston cylinder and multianvil machines apparatus both at fluid-saturated (buffered with double-capsule technique) and at fluid-undersaturated conditions.

At 3.8 GPa, 800 ˚C, fluid saturated conditions, garnet, omphacite and kyanite coexist with epidote, dolomite and magnesite. At 900 ˚C, fluid-saturated conditions, garnet and Na-poor clinopyroxene coexist with a silicate fluid/melt of granitoid composition, a carbonatitic melt and a Na-carbonate. At 4.2 GPa, moving from fluid-undersaturated conditions in the subsolidus, garnet and Na-rich clinopyroxene coexist at 900 ˚C with a carbonatitic melt and dolomite. The carbonatitic melt is richer in Ca compared to dolomite, consistently with phase relationships in the model system $MgCO_3$-$CaCO_3$. H_2O-component deriving from a fluid-absent melting of epidote, enlarged in its pressure stability in *An*-rich gabbros, promotes melting of carbonates.

When entirely characterized and demonstrated, the possibility of extracting carbonatitic melts from the differentiated rocks of a subducting slab at depths in the order of 120-130 km offers new scenarios on the metasomatic processes in the lithospheric wedge of subduction zones and a new mechanism for recycling carbon.

Dasgupta et al. (2004) Earth Planet. Sci. Lett. 227, 73–85

Poli & Schmidt (2004) Rev. Mineral. Geochem. 56, 171–195.