^{187}Os-HSE-Se-Te systematics of subducted oceanic crust

M. LISSNER[1*], A. LUGUET[1], T. NAGEL[2], S. SCHUTH[3], S. KÖNIG[4] AND D. GARBE-SCHÖNBERG[5]

[1]Steinmann Institute for Mineralogy, University of Bonn, Germany mlissner@uni-bonn.de (* presenting author)
[2]Dept. for Geosciences, Aarhus University, Denmark
[3]Institute for Mineralogy, University of Hannover, Germany
[4]Dept. for Geosciences, University of Tuebingen, Germany
[5]Dept. for Geosciences, University of Kiel, Germany

Subduction zones represent the sites of the highest mass fluxes between crust and mantle known in the Earth. While these fluxes are well understood for the lithophile elements and isotope systems, the behavior of chalcophile (Se, Te) and highly siderophile elements (HSE: Os, Ir, Ru, Pt, Pd, Re) during dehydration of subducting oceanic crust is poorly constrained.

Hence we present new ^{187}Os-HSE and first Se-Te data on a set of paleo-subduction rocks from Syros (Greece). Samples comprise fragments of subducted and then rapidly exhumed oceanic crust, fully recrystallized to blueschist and eclogite mineralogies with no or only minor signs of retrogression. Thermodynamic modeling indicates P-T conditions of 1.7-2.0 GPa and 450-550 °C, close to previous peak P-T estimations. Normalized REE patterns of meta-gabbros and -basalts are similar to those of oceanic gabbro and MORB. Strikingly, when compared to the average MORB, the studied metabasites show overall depletions in Pt (75%), Pd (85%), Re (80%), Se (70%) and Te (5%) but enrichments in Os (80%) and Ir (40%). This fractionation is likely linked to the replacement of magmatic sulfides (pentlandite+pyrothite+ chalcopyrite) by the denser pyrite at high pressure and in the presence of a fluid with low metal/sulfur. During this reaction, part of the HSE (Pd, Pt, Re and Se) are mobilized by the fluid and potentially transferred to the sub-arc mantle, while the residual HSE budget is controlled by pyrite and silicates. Metabasites yield radiogenic ^{187}Os/^{188}Os (0.168-4.0). Although some eclogites have Re-Os model ages (T_{MA}) that cluster around 80 ± 6 Ma, indistinguishable from a magmatic zircon age of 80 ± 2 Ma, most samples yield much older and erratic model ages suggesting Re loss during HP metamorphism and/or contamination by components with high ^{187}Os/^{188}Os (e.g., seawater). Recycling of subducted oceanic crust with such high ^{187}Os/^{188}Os would, to some extent, explain the heterogeneous ^{187}Os/^{188}Os of Ocean Island Basalts and some plume-related enriched MORB.