Geophysical Research Abstracts
Vol. 14, EGU2012-3893-1, 2012
EGU General Assembly 2012

A 1-Ga history of melting in the western Mediterranean Subcontinetal Lithospheric Mantle recorded in chromitites from the Ojén Ultramafic Massif (SW Spain)

J.M González-Jiménez (1), C Marchesi (2), W.L. Griffin (1), R Gutiérrez-Narbona (3), J.-P Lorand (4), S.Y O'Reilly (1), C.J. Garrido (2), F Gervilla (3), and N.J. Pearson (1)

(1) ARC Centre of Excellence for Core to Crust Fluid Systems (CCFS) and GEMOC National Key Centre, Department of Earth and Planetary Sciences, Macquarie University, Sydney, Australia (jose.gonzalez@mq.edu.au), (2) Instituto Andaluz de Ciencias de la Tierra (CSIC-UGR), Granada, Spain., (3) Departamento de Mineralogía y Petrología, Universidad de Granada, Granada, Spain., (4) Unité de Recherche Minéralogie, Muséum National d'Historie Naturelle and CNRS (UMR 7160), CP 53, 61 Rue Buffon, 75005 Paris, France.

Small (< 10 m) Cr- (Cr# = 0.84-0.60) and Al-rich (Cr# 0.57-0.40)] chromitite bodies are enclosed in tabular dunite hosted in lherzolite of the Ojén ultramafic massif (SW Spain). Field observations and thermochronology constrain the formation of chromitites circa 22 Ma, before the emplacement of the massif into the lower crust. Estimation on the composition of the chromitite parental melt suggests that they contained 0.1-0.3 wt% Cr_2O_3.Mass balance calculations reveal that a typical Ojén high-Cr chromitite (5 m long and 0.3 cm thick) contains 1.8-2.4$\times10^3$ kg of Cr, implying that each chromitite body integrates 300-1500 m^3 of partial melts formed by melting of 7-29$\times10^3$ m^3 of peridotite. An Ojén high-Al chromitite body of similar size contains 1.4-1.8$\times10^3$ kg of Cr, integrating 250-1050 m^3 of partial melts formed by melting of 5-21$\times10^3$ m^3 of peridotite. These calculation suggest that the chromitite bodies formed by focusing small melt fractions into dunite channels after kilometer-scale infiltration in the Subcontinental Lithospheric Mantle.

The examination of the *in situ* Os isotopic composition of accessory platinum-group minerals (PGM) and base-metal minerals (BMM, including sulfides and arsenides) from both chromitite-types and host-rock peridotites reveals similar distributions of Re-depletion (T_{RD}) model ages. T_{RD} model ages calculated for chromitite-hosted PGM-BMM cluster at $\sim$0.3 Ga and minor peaks extend back to $\sim$ 1.4 Ga, whereas base-metal sulfides (BMS) hosted in peridotite show a relatively minor age peak at $\sim$0.2 Ga and two prominent peaks at $\sim$ 0.6 and 1.2 Ga. The preservation of Proterozoic to Paleozoic Os model ages in the chromitite-hosted PGM-BMM indicates that the small-volume melts that produced the chromitites scavenged Os from relict phases in mantle peridotite during melt transport and melt-rock reactions ca 22 Ma ago. These variable Os model ages reflect the origin of Os from volumes of the subcontinental lithospheric mantle that underwent multiple melting and metasomatic events since the Mesoproterozoic. The preservation of these old events in mineral phases hosted in the small chromitite bodies reflects the precipitation of small volumes of mantle melts and emphasizes that the chromitites are key materials for studying the evolution of the upper mantle.