

An *in situ* trace elements study of serpentinites from the MARK area (ODP site 920, 23°N)

M. ANDREANI^{1*}, M. GODARD¹ AND C. MEVEL²

¹Laboratoire de Géosciences, UM2/CNRS, Place Eugène Bataillon, 34095 Montpellier, France

(*correspondence: andreani@msem.univ-montp2.fr, godard@gm.univ-montp2.fr)

²IPGP, CNRS, 4 Place Jussieu, 75005 Paris, France (mevel@ipgp.jussieu.fr)

The numerous ultramafic-hosted hydrothermal systems discovered during the last ten years emphasized the importance of mantle peridotite alteration as means of chemical exchange between the mantle and the ocean at slow- and ultra-slow spreading ridges. Yet, little is known on the chemical variability of serpentinites at the ridge and the local scale. This is determinant for constraining mass transfers at ridge axis and then the input budget in subduction zones.

We present the results of the detailed petrostructural and geochemical study of 12 serpentinitized harzburgites (60-100 % alteration) sampled at ODP Site 920 (23°N, Mid-Atlantic Ridge). The serpentinite composition was determined on bulk rock and on primary and alteration minerals by ICP-MS and HR-ICP-MS coupled to laser ablation respectively.

Site 920 serpentinites have depleted trace element bulk rock compositions (mostly < 0.2 x PM) typical of that of refractory mantle peridotites, except for highly mobile elements such as U (up to 10 x PM), B (4-45 ppm), As and Sb (up to 10 ppm). This suggests that the bulk rock geochemistry of the serpentinites has preserved the peridotite primary signature for most trace elements. In contrast, *in situ* analyses indicate extensive chemical exchanges at the thin section scale. Pyroxene and olivine have depleted compositions (Yb: cpx = 0.9, opx = 0.2, olivine = 0.01 ppm) with typical light REE depleted patterns. Bastite (formed after pyroxene) preserves the primary mineral composition whereas mesh texture serpentine (formed after olivine) has enriched trace element compositions compared to olivine. All secondary phases are characterized by flat REE patterns indicating relative enrichments in light REE. Mobile elements are also more abundant in the secondary phases (e.g., As 0.1-5 ppm, B 20-100 ppm). The composition of the serpentine mesh and associated veins varies strongly within a same sample. Strongest enrichments in mobile element are observed in the mesh, where main fluid pathways between olivine grains where probably located. Talc-tremolite veins display enriched compositions (0.3-3 x PM) with a flat REE pattern and a positive Eu anomaly. These results are discussed in terms of mass budget between phases and at the scale of site 920.

High precision nickel isotope measurements of Fe-Ni metal in meteorites

K.T. ANDREWS*, M. SCHILLER AND J.A. BAKER

School of Geography, Environment and Earth Sciences, Victoria University of Wellington, P.O. Box 600

Wellington, New Zealand (*kimtandrews@gmail.com)

Nickel is potentially a powerful early Solar System chronometer and tool to identify the astrophysical setting in which our Solar System formed. Variations in ⁶⁰Ni can potentially result from the decay of short-lived ⁶⁰Fe ($t_{1/2} = 1.49$ Myr) which can identify supernova contributions, and variations in the neutron-rich isotopes, ⁶²Ni and ⁶⁴Ni, can reveal different stellar nucleosynthetic inputs into the proto-Solar System. However, recently published Ni isotope data for meteorites has produced conflicting results [1-3]. In this study, Fe-Ni metal from irons and pallasites was subjected to column chemistry following the methods of either [3] or [4]. This chemistry results in the effective separation and > 99% recovery of Ni.

Ni isotope ratios were measured on a Nu Plasma MC-ICPMS. Our preferred normalisation scheme uses the ⁶¹Ni/⁵⁸Ni ratio to correct for instrumental mass bias, although all other possible correction schemes are monitored to assess data integrity. Ni isotope analyses have uncertainties (2 se) on mass-bias-corrected $\epsilon^{60}\text{Ni}$ and $\epsilon^{62}\text{Ni}$ that are typically $\leq \pm 0.13$ and $\leq \pm 0.25$, respectively. Average uncertainties from multiple analysis of samples for mass-bias-corrected $\epsilon^{60}\text{Ni}$ and $\epsilon^{62}\text{Ni}$ are $< \pm 0.05$ and $< \pm 0.10$, respectively.

Preliminary results of this study differ from those published in [3]. Nickel isotopes exhibit very limited variations compared to the terrestrial standard. $\epsilon^{60}\text{Ni}$ values range from +0.016 to -0.089. $\epsilon^{62}\text{Ni}$ values range from +0.107 to -0.042. The data produced in this study does not clearly reveal significant deficits in ⁶⁰Ni that might be attributed to a late (or early) supernova ⁶⁰Fe input into the young Solar System, or large ⁶²Ni variations in irons and pallasites that are significantly different from Earth that might represent preservation of Ni nucleosynthetic variability on a planetary scale in the Solar System.

- [1] Quitte G. *et al.* (2006) *Earth Planet. Sci. Lett.* **242**, 1625.
- [2] Cook D. L. *et al.* (2006) *Anal. Chem.* **78**, 8477-8484.
- [3] Bizzarro M. *et al.* (1007) *Science* **316** (5828) 1178-1181.
- [4] Quitte G. & Oberli F. (2006) *J. Anal. At. Spectrometry* **21**(11) 1249-1255.