

Mantle rocks exhumed along an ocean-continent transition: revisiting the Iberian margin peridotites (ODP Leg 149 and 173)

Secchiari A.*¹, Godard M.², Montanini A.¹ & Luguet A.³

¹ Dipartimento di Scienze Chimiche, della Vita e della Sostenibilità Ambientale, Università di Parma. ² Géosciences Montpellier, Université de Montpellier (France). ³ Institut für Geowissenschaften, Universität Bonn (Germany).

Corresponding author e-mail: arianna.secchiari@unipr.it

Keywords: mantle, Iberia, IODP.

Investigating peridotite samples exposed along ocean-continent transitions is crucial to shed light on processes occurring in the upper mantle during lithospheric breakup, unravelling, at the same time, source heterogeneity and inheritance.

More than three decades ago, mantle rocks were recovered along the West Iberian margin during several ODP cruises (Leg 103, 149, and 173; see Abe, 2001; Chazot et al., 2005). Despite being one of the few sites worldwide where mantle has been accessed through scientific drilling, Iberian peridotites remain poorly characterized.

Here, we revisit Iberian peridotites through a combined petrological and geochemical study performed on a new set of mantle samples from ODP Holes 899B, 1068A, and 1070A. Hole 899B peridotites are relatively fresh, clinopyroxene-rich ($\approx 5-8$ vol.%) tectonite harzburgites. They mostly consist of deformed olivine ($\approx 80-85$ vol.%), showing variable Fo contents (89.1-92.1), and low amount ($\approx 10-12$ vol.%) of exsolved, Mg-rich orthopyroxene. Dark brown spinel (< 1 vol.%, Cr# = 0.198-0.483; TiO₂ = 0.10-0.72) mainly occurs as elongated grains, sometimes rimmed by altered plagioclase.

In contrast to Hole 899B, peridotites from Holes 1068A and 1070A are highly serpentinized. Samples from Hole 1068A have chromian spinel (Cr# = 0.253-0.376) mantled by a fine-grain white rim, possibly representing a pseudomorph after plagioclase. Clinopyroxene relics display highly variable Al₂O₃ (3.77-7.25 wt.%) and TiO₂ contents (0.38-0.75 wt.%), in contrast to the lower and more homogenous values of Hole 1070A samples (3.87-4.70 wt.% and 0.14-0.20 wt.% for Al₂O₃ and TiO₂, respectively). High Mg# (0.915-0.920) olivine and orthopyroxene with low- to moderate Al₂O₃ contents (2.52-3.70 wt.%) are only preserved in Hole 1070A.

In situ trace element investigation revealed convex-upward patterns for Holes 899B and 1068A clinopyroxene, in the range of modern abyssal peridotites. Clinopyroxene shows LREE-depleted segments (La_N/Sm_N = 0.01-0.27) and flat HREE for Yb_N ≈ 10 , coupled to Eu negative anomalies. Orthopyroxene of Hole 899B yields low REE concentrations (HREE_N ≤ 1) and spoon-shaped patterns, except for the plagioclase-bearing sample, which exhibits a straight pattern (La_N/Yb_N = 0.001-0.02) and negative Eu anomalies. Hump-shaped REE patterns with steep LREE slopes (La_N/Sm_N = 0.003-0.01) and flat HREE segments are observed for Hole 1070A orthopyroxene.

Our preliminary results indicate that the mantle exhumed along the ocean-continent transition of the Iberian margin experienced variable degrees of depletion and melt/rock interaction.

Abe N. (2001) - Petrochemistry of serpentinized peridotite from the Iberia Abyssal Plain (ODP Leg 173): its character intermediate between sub-oceanic and sub-continental upper mantle. Geol. Soc. (London), Spec Publ., 187, 143-159.
Chazot G., Charpentier S., Kornprobst J., Vannucci R. & Luis B. (2005) - Lithospheric mantle evolution during continental Break-up: the West Iberia non-volcanic passive margin. J. Petrol., 46, 2527-2568.