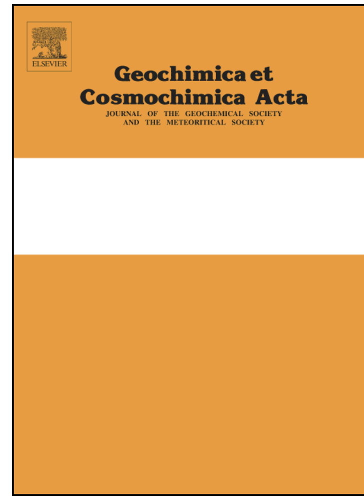
Accepted Manuscript



Pressure-dependent compatibility of iron in garnet: insights into the origin of ferropicritic melt

JunBo Zhang, YongSheng Liu, WenLi Ling, Shan Gao

PII: S0016-7037(16)30625-1
DOI: http://dx.doi.org/10.1016/j.gca.2016.10.047
Reference: GCA 10002

To appear in: *Geochimica et Cosmochimica Acta*

Received Date: 27 April 2016
Revised Date: 12 October 2016
Accepted Date: 27 October 2016

Please cite this article as: Zhang, J., Liu, Y., Ling, W., Gao, S., Pressure-dependent compatibility of iron in garnet: insights into the origin of ferropicritic melt, *Geochimica et Cosmochimica Acta* (2016), doi: http://dx.doi.org/10.1016/j.gca.2016.10.047

Pressure-dependent compatibility of iron in garnet: insights into the origin of ferropicritic melt

JunBo Zhang [a,b], YongSheng Liu [a,b*], WenLi Ling [a,b], Shan Gao [a,b]

a. *School of Earth Sciences, China University of Geosciences, Wuhan 430074, China*

b. *State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences, Wuhan 430074, China*

*Corresponding author. State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences, Wuhan 430074, China. Tel: 86-27-67883003; Fax: 86-27-67885096.

Email address: yshliu@hotmail.com (Y.-S. Liu)

Abstract

Iron-rich silicate melts in the Earth's deep mantle have been seismologically and geochemically inferred in recent years. The origin of local enrichments in iron and low-velocity seismic anomalies that have been detected in dense mantle domains are critical to understanding the mantle's evolution, which has been canonically explained by long-term chemical reactions between the Earth's silicate mantle and its liquid iron outer core. However, the Pleistocene alkaline ferropicrites (~0.73 Ma) from Wudi, North China, show chemical and Sr-Nd-Os isotopic features that suggest derivation from the preferential melting of silica-deficient eclogite, a lithology of delaminated mafic lower continental crust that had stagnated at mid-upper mantle depths during the Mesozoic decratonization of the North China block. These rocks are characterized by substantial enrichment in iron (14.9–15.2 wt% Fe_2O_3), relative depletion in silica (40–41 wt% SiO_2) and decoupled Y and heavy rare earth element (HREE) compositions. These ferropicrites have particularly higher Y/Yb ratios than the other Cenozoic basalts from North China. The pressure-dependent compatibility of Fe, Y and Yb in eclogitic garnet can adequately explain the Fe-enrichment and Y-HREE decoupling of the Wudi ferropicrites and indicates that the eclogites were melted at pressures of 5–8 GPa, as also constrained by previous high-P-T experiments. This