Geochemical and Nd-Hf isotopic constrains on the origin of the ~1.74 Ga Damiao anorthosite complex, North China Craton

TAI-PING ZHAO AND WEI CHEN

Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Guangzhou, China 510640
(*correspondence: tpzhao@gig.ac.cn)

The ~1.74 Ga Damiao complex in the North China Craton consists of anorthosite (85 volume%) norite (10 volume%) mangerite (4 volume%) accompanied by minor troctolite and noritic, gabbroic and ferrodioritic dykes [1,2,3]. The complex hosts abundant Fe-Ti-P-V ores and has an emplacement sequence from anorthosite, norite, Fe-Ti-P deposit to mangerite. Anorthosites and norites are mainly composed of antiperthite ($An_{44}Ab_{50}Or_6$) and high-Al orthopyroxene megacrysts indicative of their polybaric crystallization. Their variable major and trace elemental compositions suggest that these rocks are the mixtures of cumulus minerals with trapped liquids.

The diverse components of the Damiao complex have similar REE patterns and Nd-Hf isotopic compositions with $\varepsilon_{Nd}(t)$ values mostly within -5.0 to -4.0. Average $\varepsilon_{Hf}(t)$ values of zircon are -4.7 for mangerite and -5.9 for norite, suggesting that they formed from a common parental magma by continuous fractionation. The occurrences of plagioclase and high-Al orthopyroxene megacrysts, together with the high calculated Sr contents (407-722 ppm), indicate that their parents would be high-Al gabbroic. Such high-Al gabbroic magma most likely originated from a lower crust source, as suggested by their high La/Nb (mostly >1.5) and Zr/Nb (10.2-40.2) but low La/Yb (<10) ratios. This interpretation is also supported by the zircon $\varepsilon_{Hf}(t)$ and whole-rock $\varepsilon_{Nd}(t)$ values that plot close to the evolution lines of the ~2.5 Ga Archean rocks in the North China Craton. High-degree melting (>75%) of the lower crustal rocks require high temperatures when forming the parental high-Al gabbroic magma. Such scenario can be compatible with the widely accepted major orogeny that occurred at ~1.85 Ga in the North China Craton. This collision may have resulted in downthrusting of crustal rocks into the upper mantle where ambient high temperatures were able to melt the thrust crust tongue directly to form an initial deep-seated magma chamber[4] during post-collisional extension at ~1.74 Ga.

[1] Ye *et al*. (1996) *Field Trip Guide* T216. 30th IGC. [2] Zhao *et al*. (2004) *Acta Petrol. Sinica* **20**, 685-690 (in Chinese). [3] Xie (2005) Beijing: Science Press,1-172 (in Chinese). [4] Duchesne *et al*. (1999) *Terra Nova* **11**,100-105

Deformation and component migration during mylonitization in ductile shear zones, south Tan-Lu fault belt

XIAOYAN ZHAO AND ERGEN GAO

Institute of Disaster Prevention Science and Technology, Yanjiao,101601, Beijing, China (grg@ustc.edu.cn)

Introduction

Because mylonites record special phenomena in the geological process of crustal deformation, geologists have paid great attention to them from various aspects. There are a series of ductile shear zones developed in slide formation of south Tan-Lu fault belt [2]. The relationship between metamorphism and deformation in ductile shear zones, south Tan-Lu fault has been extensively studied by Yang *et al*. [1,3]. This study mainly pays attention to the relationship between the volume loss, fluid flow and component variations in differnent ductile shear zones in south Tan-Lu fault belt, trying to illustrate the elemental migration mechanism during crustal deformation.

Results

The mylonites are enriched by factors of 1.50 or so in elements of TiO_2, P_2O_5, MnO, Y, Zr and V and depleted in SiO_2, Na_2O, K_2O, Al_2O_3, Sr, Rb, U, Ba and light REEs compared to their protolith gneiss. The immobile element enrichments are attributed to enrichments in residual phases such as ilmentite, zircon, apatite and epidote in mylonites and are interpreted as due to volume losses from 10% to 55% in different ductile shear zones. The largest amount of SiO_2 loss is 37g/100g in the ductile shear zone, which shows the fluid infiltration. Modeling calculated results of the fluid/rock ratio for these ductile shear zones range from 200 to 1200 by assuming different degrees of fluid saturation.

This study is supported by the National Natural Science Foundation of China (Grant No.: 40674071).

[1] Yang X.Y. *et al.* (1998) *Acta Geologica Sinica*, **72**, 37-50. [2] Yang X.Y. *et al.* (2001) *Neues Jahrbuch für Mineralogie, Monatshefte*, H(9-10) 415-432. [3] Yang X.Y. *et al.* (2007) *Acta Geologica Sinica*, **76**, 297-311.