Polyphase evolution of the Eastern Ghats Belt (India) - A multi mineral approach using Rb-Sr and U-Pb ages

EMELIE AXELSSON*, KLAUS MEZGER AND IGOR M. VILLA

Institute of Geological Sciences, University of Bern, Baltzerstrasse 3, 2012 Bern, Swizerland. (*correspondence: axelsson@geo.unibe.ch)

The Eastern Ghats Belt (EGB) is a granulite facies metamorphic belt along the east coast of India. It is a patchwork of discrete crustal segments with distinct geological histories. It records the formation and destruction of at least two earlier supercontinents, namely Colombia (ca 2.1-1.8 Ga) and Rodinia (ca 1.0-0.9 Ga); as a part of the amalgamation of India, east Antarctica, and Australia into the SWEAT (SW United States and East Antarctica) terrane.

Four crustal domains with unique isotopic signatures and ages can be distinguished within the EGB [1]. The highest-grade metamorphism was attained during the regional metamorphism at ca 950 Ma. The subsequent evolution was proposed to be slow cooling at a rate of ca. 1-2°C/Ma [2].

To reconstruct the post-peak evolution after the 950 Ma metamorphic imprint, Rb-Sr biotite ages were determined from biotite-rich metapelitic gneisses. These ages cluster around 500 Ma for most of the Eastern Ghats belt. The anlaysed biotite samples have high Mg content, and the general mineral assemblage is that typical of high temperature granulites: plag + phl + sil + grt and, depending on the protolith, kfs, crn or crd. Common accessory mineral phases are: rt, zrc, spl, ap, spr.

Very young biotite ages like these are unlikely to be the result of slow cooling from the granulite facies conditions at ca 950 Ma. Instead they record a low-grade static thermal overprint of the orogenic belt. This overprint coincides with high-grade meteamorphism in southern India and Sri Lanka (ca 580-550 Ma), corresponding with the Pan-African orogeny. The young ages on a regional scale extend the known area of the pan-African overprint in India significantly.

[1] Rickers, K., Mezger, K., Raith, M. (2001), *Precambrian Research*, **112**:28. [2] Mezger, K., Cosca, M.A. (1999), *Precambrian Research*, **94**:251-271

Petrological and Geochemical Constraints on the origin and evolution of the Early Campanian porphyritic rocks from the Eastern Pontide Magmatic Arc, NE-Turkey

FARUK AYDIN

Department of Geology, Karadeniz Technical Univ., 61080, Trabzon, Turkey (faydin61@gmail.com)

Petrogenesis of the porphyritic rocks in the Eastern Pontides, NE Turkey, play a critical role in determining the nature of the continental crust and mantle dynamics during late Mesozoic subduction processes. In this study, we described, for the first time, the early Campanian (81±0.5 Ma) porphyritic rocks cutting the late Cretaceous volcanic units in the region. The porphyritic rocks were observed as small stocks (< 1km^2) in the study area and they generally contain mafic magmatic enclaves (MMEs). The host porphyritic rocks comprise quartz diorite and tonalite (SiO_2= 64–70 wt%, Mg#= 0.40-0.52) and the MMEs are gabbroic diorite in composition (SiO_2= 51–57 wt%, Mg#= 0.36-0.50). The host rocks have a microgranular porphyritic texture, and they contain 15-25% phenocryst of plagioclase and amphibole with a matrix composing plagioclase ± quartz ± orthoclase ± apatite ± zircon ± Ti-magnetite. Compared to the host rocks, the MMEs are finer grained, and they contain higher proportion of ferromagnesian phases and less feldspar minerals.

Geochemically, the samples usually show a high-K calc-alkaline composition and I-type features with metaluminous character. The host porphyritic rocks and the MMEs are characterized by enrichment of LILE and depletion of HFSE with negative Nb and Ti anomalies. The chondrite-normalized REE patterns are fractionated [$(La/Yb)_N$ = 5-17] and moderately display Eu anomalies (Eu/Eu* = 0.5-1.2). All samples have weak concave-upward REE patterns, suggesting that amphibole and garnet played a significant role in their generation during magma evolution. The host rocks and their enclaves are isotopically indistinguishable. Sr–Nd isotopic data for all of the samples display I_{Sr} = 0.7085–0.7087, ε_{Nd} (81 Ma) = -6.0 to -6.9, with T_{DM} = 1.38–1.63 Ga. Pb isotopic ratios are ($^{206}Pb/^{204}Pb$) = 18.61–18.69, ($^{207}Pb/^{204}Pb$) = 15.66–15.69 and ($^{208}Pb/^{204}Pb$) = 38.78–38.90.

All geochemical results and the Ar–Ar crystallization age, combined with previous regional studies, suggest mixed-origin magma generation in a subduction setting.

DOI:10.1180/minmag.2013.077.5.1