



The role of shallow open system processes in the evolution of South Tepeldag Pluton (NW Turkey): insights and constraints from thermodynamic modelling

Tunahan Arık, Ömer Kamacı, Işıl Nur Güraslan, and Şafak Altunkaynak

Istanbul Technical University, Geological Engineering, Istanbul, Turkey (tunahanariik@gmail.com)

Eocene granitoids in NW Anatolia occurred following the continental collision between Sakarya Continent and Tauride-Anatolide Platform and mark the onset of post-collisional magmatism in the region. One of the representative members of the Eocene granitoids, the Tepeldag pluton crops out as two isolated granitic bodies and is intruded into the Cretaceous blueschist assemblages (Kocasu formation) and ophiolitic rocks within the Izmir-Ankara-Erzincan suture zone (IAESZ). South Tepeldag pluton (STP) is composed mainly of granodiorite with subordinate quartz diorite, which show transitional contacts. Aplitic dykes crosscut the pluton as well as the country rocks. STP includes a number of mafic microgranular enclaves (MME) of gabbro/diorite composition.

Geochemically, STP shows distinct I-type affinity with a metaluminous to slightly peraluminous ($ASI \leq 1.02$) nature. The samples are medium-K to high-K calc-alkaline in character. They exhibit depletion in HFSE (Ti, Hf, Zr, Nb and Ta) compared to large ion lithophile elements (Rb, Ba, Th, U, K) and presents negative Nb, P, Ti anomalies. STP displays slight negative Eu anomalies ($Eu/Eu^* = 0.7-1.2$), enrichment in LREE and flat HREE patterns in chondrite-normalized spider diagrams. MELTS modeling (with initial parameters of 1–3 kbar pressure, 2–3% water and QFM-NNO oxygen fugacity buffers) indicate that compositional variations in STP samples can be interpreted as a result of open system processes (assimilation fractional crystallization) rather than a reflection of fractional crystallization in the upper crustal magma chamber. All thermodynamic simulations dictate a crustal assimilation, especially in the late stages of the magmatic process, with a MgO, Na₂O and Al₂O₃-rich assimilant similar to the suture zone (IAESZ) rocks.