



Origin of postcollisional intrusions in NW Anatolia, Turkey: Implications for magma chamber processes

Namik Aysal

Istanbul University, Department of Geological Engineering, Faculty of Engineering, 34320 Istanbul, Turkey

Post-collisional magmatic activities of NW Anatolia are represented by a series of granitic intrusions and volcanic successions in the Biga Peninsula, NW Turkey. These plutonic rocks have distinct textures, chemical compositions and Sr-Nd isotope characteristics. They consist of coarse grained, equigranular and/or hypidiomorphic textured granite, gronodiorite, monzogranite, quartz-monzonite, pyroxene-monzonite and leucocratic alkali feldspar granites. These intrusions are composed of quartz, K-feldspar, plagioclase, hornblende, pyroxene and biotite. However, leucocratic facies rocks contain tourmaline with minor amount of mafic minerals. Accessory phases are represented by zircon, apatite, monozite, magnetite, sphene and rarely allanite. ASI values of the plutonic rocks vary between 0.7 and 1.24. These intrusive rocks are therefore classified as metaluminous-peraluminous with I-type affinity. K2O contents show that the intrusive rock samples show calc-alkaline, high K-calc-alkaline and shoshonitic character. Initial $87\text{Sr}/86\text{Sr}(t)$ (0.69980–0.70835), $143\text{Nd}/144\text{Nd}(t)$ (0.51238–0.51247) isotope ratios and negative $\varepsilon\text{Nd}(t)$ (-4.4 – -2.6) values imply that these intrusive rocks could have been derived from enriched mantle sources. N-MORB normalized spidergrams of NW Anatolian plutonic rocks display enrichments in large ion lithophile elements (LILE), light rare earth elements (LREE) and depletion in high field strength elements (HFSE) indicating hydrous melting of a mantle wedge in a subduction zone and/or enrichment of the mantle source with an inherited subduction component from an ancient arc magmatism. Chondrite-normalized Rare Earth Element spidergrams are indicative of the importance of plagioclase and amphibole fractionation. On tectonic discrimination diagrams, all granite samples fall into the volcanic arc granite, syn and post-collisional granite fields. The geochemical data also indicate that a number of magma chamber processes involving magma mixing, fractional crystallization (FC) and assimilation with fractional crystallization (AFC, EC-AFC) might have been operational during the magma chamber evolution. These stocks were dated by using K/Ar method on hornblende, biotite and whole rock samples and U/Pb LA-ICP-MS zircon dating, yielding ages between 20.2 ± 0.9 Ma and 27.89 ± 0.17 Ma (Upper Oligocene – Lower Miocene). The widespread Upper Oligocene – Lower Miocene plutonism in NW Turkey is thought to be linked to crustal thinning resulted from slab roll-back and syn-convergent extensional regime after the collision between the Sakarya Zone and Anatolide–Tauride platform.