PETROGENESIS OF THE PIKES PEAK BATHOLITH (COLORADO)

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The ~1.08-Ga Pikes Peak batholith (PPB) of central Colorado is a "type" example of A-type granitic magmatism. Rocks of the PPB can be divided into two groups, based on chemical and mineralogical characteristics: (1) a *potassic* series (~64-78 wt % SiO_2; K/Na = 0.95-2.05), which is dominated by biotite granite and comprises >97% of PPB exposures, and (2) a *sodic* series (~44-78 wt % SiO_2; K/Na = 0.32-1.36), which includes gabbro/diabase, syenite/quartz syenite, and fayalite-/sodic amphibole-bearing granites.

Gabbros and mafic dikes associated with the sodic granitoids have $\varepsilon_{Nd}(T)$ (+3.5 to –3.0) that are lower than depleted mantle. Primitive mantle-normalized trace element patterns for PPB mafic rocks exhibit overall enrichments but Nb-Ta depletions, suggesting derivation from mantle sources that were previously affected by subduction-related processes. However, assimilation of 1.7-Ga arc-derived crust during ascent/emplacement cannot be ruled out.

The voluminous potassic granites are interpreted as partial melts derived from crustal sources of tonalitic composition, based on $\varepsilon_{Nd}(T)$ values (-0.3 to –2.7, which overlap with values for exposed ~ 1.7-Ga tonalites/granodiorites in the region) and good matches between major element compositions of the potassic granites and experimental melts (e.g., Patiño Douce, 1997). In contrast, syenites and granites of the sodic series cannot be explained as crustal melts, but are interpreted as fractionation products of mantle-derived mafic magmas. High temperature and low oxygen fugacity estimates (e.g., Frost et al., 1988) support a fractionation origin for the sodic granitoid magmas, as do their $\varepsilon_{Nd}(T)$ (-0.7 to +2.2) and trace element characteristics. Release of fluorine-rich volatiles and/or removal of pegmatitic fluids could have modified abundances of Ce, Nb, Zr, and Y in some sodic granitoid magmas.

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