Formation. The mafic micaceous enclaves and the minette lavas contain high proportions of Al-Cr-Ti phlogopite and subhedral serpentine psuedomorphs after Ol ± Cpx along with less abundant Al-Ti biotite, Fe-cordierite, thermally shattered and embayed quartz, rounded and sieve-textured grains of plagioclase and sanidine, and groundmass microlites of Ba-sanidine and rare orthopyroxene. The rhyodacitic intrusions exhibit the inverse mineral proportions and, commonly only preserve fresh phlogopite. Collectively, the inferred xenocrysts in these rocks are compositionally equivalent to the phenocrysts in the opposing suite, although minor variation in mineral chemistry suggests slightly differing S-type anatectic and minette end-member magma compositions were locally involved. These data imply that minette magmas, representing small degree partial melts of a lithospheric mantle source, entered the middle crust, acted as heat sources, fluxed both radiogenic heat-producing and volatile elements, and facilitated the late Oligocene episode of high-*T*, low-*P* upper crustal anatexis. The minettes co-mingled and mixed with the associated PSGS S-type crustal melts, a relationship readily documented because of the favoured stability of the volatile-rich trioctahedral micas during such processes. Extensive evidence for mixing of PSGS with diverse potassic, mantle-derived melts offers an explanation for the anomalously elevated cafemic element (e.g., Mg, Fe, Ca, Cr, and Ni) and radiogenic element ($K_2O$, Rb, Th, and U) contents of many PSGS "S-type" granites (or rhyodacites) in southeastern Peru, and also in other igneous provinces characterized by comparable low-*P*, high-*T*, PSGS rocks.

## Epizonal commingling and mixing of minette and cordierite-biotite (S-type) magmas, south Quenamari Meseta, Puno Department, southeast Peru

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In the Cordillera de Carabaya of southeastern Peru, exposed immediately south of the Quenamari Meseta, upper Oligocene – Lower Miocene (ca. 23.2–23.9 Ma) rocks of the Picotani Group of the Crucero Supergroup preserve evidence of commingling and mixing between diverse minette and cordierite-biotite S-type (PSGS) rhyodacitic-monzogranitic magmas. Three such localities include: (1) the, hypabyssal, porphyritic, cordierite-biotite ± sillimanite rhyodacitic Ninahuiza Stock containing dispersal clouds of "scalloped" mafic micaceous enclaves and widely dispersed phlogopite xenocrysts: (2) the hypabyssal, porphyritic, cordierite-biotite ± sillimanite rhyodacitic Quebrada Centilla stock containing dispersed phlogopite xenocrysts and; (3) the plagioclase-quartz-sanidine xenocryst-bearing, minette lava flows of the Lago Perhuacarca




Atlantic Geology, 2010, Volume 46, Number 1