HIGHLY DIFFERENTIATED "TOPAZ" RHYOLITE IN THE HIGH PLATEAU PROVINCE OF SOUTHERN PERÚ

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High-silica rhyolite is present in various parts of southern Perú. Rhyolite from two localites, the Cailloma caldera and the newly recognized Río Chalhuanca dome field, both in Arequipa Department, belong to the group of "topaz" rhyolites well known in the eastern and central parts of the Great Basin and New Mexico, Western U.S., and in many localities in Mexico (e.g., Christiansen et al., Geol. Soc. Am. Spec. Paper 205). The Peruvian occurrences may be the first topaz rhyolites recognized in South America.

The Río Chalhuanca dome field, with an average diameter of about 15 km, is centered at Lat. 15°40'S; Long. 71°20'W in the Callalli quadrangle directly east of the main road from Arequipa to Cuzco. The volcanic domes are composed of rhyolite lava containing abundant large phenocrysts of sanidine and quartz with minor sodic plagioclase and biotite. Although mapped by Ellison and De La Cruz (1989) as "intrusivo pórfido", these rocks are lavas, as shown by well-developed flow foliation and spherulitic devitrification and, locally, glassy groundmass and gas cavities lined with vapor-phase crystals. Sanidine phenocrysts from glassy rhyolite give a very reliable laser-fusion $^{40}Ar/^{39}Ar$ age of 17.11±0.10 Ma. The undeformed and very well preserved state of the dome field suggests location within a rigid structural block. No hydrothermal alteration or mineralization related to the field has yet been recognized.

Glassy groundmass material from densely welded tuff of the lower ash-flow sheet of the Pliocene Cailloma Tuff and glass from dense lava from the Río Chalhuanca field are high-silica rhyolite with low CaO and Fe as Fe_2O_3 (0.38, 0.79; 0.60, 0.80 wt.%, respectively). Sr, Ba and Zr contents are low (12, 37, 81 ppm; 17, 62, 82 ppm), as is Eu/Eu* (0.035; 0.11), although not so low as in some high-silica rhyolite glasses. Moderate Al_2O_3 (13.3; 13.1 wt.%) and low P_2O_5 (0.02 wt.%) contents and the absence of aluminosilicate phenocrysts show that the rocks are not strongly peraluminous "S-type" rhyolite such as those of the Macusani (Perú) and Morococala (Bolivia) volcanic fields. The Cailloma and Río Chalhuanca rhyolites also differ markedly from typical highly evolved subalkaline rhyolites. Rb, Cs and As contents of the tuff and lava glasses are much higher (697, 36, 22 ppm; 335, 17, 27 ppm, respectively), although not so high as in those of the Macusani tuffs. Light REE are very low (La = 14.3 & 20.9 ppm), as is La/Yb (2.34; 5.22). The Cailloma Tuff glass has very high U, 34.9 ppm; Nb, 65 ppm; Ta, 10.6 ppm; U/Th, 1.47; Ta/(Ta+Th), 0.31; Be, 12 ppm; W, 8 ppm and Bi, 2.2 ppm. In contrast, at Arcata, 5.9 Ma glassy high-Si rhyolite with very low Sr & Ba (<2 & 17 ppm), associated with calc-alkalic dacite, has much lower Rb, 262 ppm; Cs, 9.6 ppm; As, <5 ppm; La, 35.0 ppm; La/Yb, 18.4; Ta, 1.9 ppm; U, 12.1 ppm; U/Th, 0.30; W, 2 ppm and Bi, 0.9 ppm. Quartz- and sanidine-rich and mafic-poor tuffs and lavas are common in the region, and many may have high-silica chemistry.