

Partitioning of Sr between coexisting minerals of the hollandite- and piemontite-groups in a quartz-rich schist from the Sanbagawa metamorphic belt, Japan

MASAKI ENAMI^{1,*} AND YASUYUKI BANNO²

¹ Department of Earth and Planetary Sciences, Graduate School of Science, Nagoya University, Chikusa-ku, Nagoya 464-8602, Japan

² Geological Museum, Geological Survey of Japan, 1-1-3, Higashi, Tsukuba 305-8567, Japan

ABSTRACT

Coexisting minerals of the hollandite-cryptomelane series, piemontite-group, and abschwurmbachite-braunite series occur as a small nodule in a quartzose schist (metachert) from the epidote-amphibolite facies area of the Sanbagawa metamorphic belt, central Shikoku, Japan. Strontium, Ba, K, and Pb contents of the hollandite-cryptomelane minerals are 0.00–0.42, 0.07–0.99, 0.00–0.75 and 0.00–0.05 apfu (atoms per formula unit; O = 16), respectively. The piemontite-group minerals can be divided into common piemontite (Ca > Sr in the ten-coordinated A2-site) and strontio piemontite (Sr > Ca). Strontium, Ba and Pb contents of the strontio piemontite reach 0.71, 0.26 and 0.20 apfu (O = 12.5), respectively, suggesting the existence of two possible new end-members for epidote-group minerals: “Ba-piemontite [BaCa(Mn³⁺, Fe³⁺, Al)₃Si₃O₁₂(OH)]” and “Pb-piemontite [PbCa(Mn³⁺, Fe³⁺, Al)₃Si₃O₁₂(OH)].” The abschwurmbachite-braunite series minerals (Cu = 0.30–0.53 apfu; O = 12) contain up to 0.34 apfu Mg, indicating the exchange Mg(Mn²⁺, Cu)₋₁. Distribution coefficients for Sr between the hollandite-cryptomelane series and the piemontite-group minerals are up to 20, implying that the hollandite-type structure with its large open tunnel is more suitable for incorporation of Sr than the A2-site of the piemontite-group minerals. A synthetic aluminosilicate analogue of the hollandite-cryptomelane compound is stable under $P > 8\text{--}10$ GPa, and suggests the hollandite-type aluminosilicate may be a reservoir of Sr and other large-ion-lithophile elements in the upper mantle.