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A new Al-rich hydroxylian pseudorutile from Kalimantan, Indonesia

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Abstract

A new type of Al-rich hydroxylian pseudorutile (HPR), containing 64.6 wt% TiO_2, 12.1 wt% Al_2O_3, 10.9 wt% Fe_2O_3, and 12.4 wt% H_2O, has been identified in detrital heavy mineral concentrates from Central Kalimantan, Indonesia. The unusual translucent orange-colored grains have been characterized using electron microprobe analyses, thermal analyses, ^{27}Al MAS NMR, and synchrotron XRD studies including the use of differential pair distribution function analysis, to determine how the Al is incorporated. The results support a model in which diaspore-form AlOOH is incorporated into nanopores in the solid hydrogel-like mineral. The HPR matrix structure comprises disordered unit-cell scale intergrowths of diaspore-type and rutile-type structure elements, which have a close dimensional match to the diaspore structure, thus providing a suitable template for epitactic nucleation and growth of the diaspore. The average composition of the grains is $[FeTi_6O_{10.8}(OH)_{5.4}]\cdot 1.8AlOOH\cdot H_2O$, where the formula within the square brackets represents the HPR matrix, and the AlOOH and H_2O occupy the intragrain pore volume.

Keywords: Hydroxylian pseudorutile, Al-rich pseudorutile, synchrotron XRD study, diaspore-rutile intergrowth structure