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An occurrence of igneous orthorhombic amphibole, Eriksberg gabbro, southern Sweden

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ABSTRACT

We document the first reported igneous occurrence of the orthoamphibole, gedrite, from a troctolitic cumulate in the Eriksberg gabbro, Sweden. The gedrite is sodic and coexists in textural equilibrium with plagioclase, orthopyroxene, Ca-amphibole, and Na-rich phlogopite. The gedrite crystallized from evolved interstitial liquid that was buffered by cumulus olivine. Geothermometry indicates that the assemblage equilibrated at around 900 °C and 4–6 kbar. Gedrite shows a convex-downward REE-profile, with a positive Eu anomaly. The rare earth element concentrations are ~0.2 to 0.8 times chondritic abundances and much lower than in coexisting Ca-amphibole. Laser ablation ICP-MS analyses show that the gedrite has much lower concentrations of Zr, Nb, Th, and U, and lower concentrations of Sr, Ba, Rb, and Pb relative to co-crystallizing Ca-amphibole. However, nickel and cobalt partition preferentially into gedrite. Comparison of Zr and Nb concentrations in early crystallized Ca-amphibole with gedrite and associated Ca-amphibole reveals that X_{mg} of amphibole is not the best criteria to use for estimates of ($D^{\mathrm{Amph/L}}_{\mathrm{Nb/Zr}}$) for cumulates where olivine is buffering the Mg/(Mg + Fe).