

Haggertyite, a new magnetoplumbite-type titanate mineral from the Prairie Creek (Arkansas) lamproite

IAN E. GREY,^{1,*} DANIELLE VELDE,² AND ALAN J. CRIDDLE³

¹CSIRO Division of Minerals, Box 312, Clayton South, Victoria 3169, Australia

²Laboratoire de Petrologie Mineralogique, Universite P. & M. Curie, ESA 7058 CNRS, 4 Place Jussieu, 75252-Paris Cedex 05, France

³The Natural History Museum, Cromwell Road, London, SW7 5BD

ABSTRACT

We describe a new titanate mineral, haggertyite, from the Prairie Creek lamproite, Arkansas, U.S.A. The mineral was found exclusively within the reaction zones surrounding small mafic xenoliths in the lamproite. Haggertyite occurs as isolated platelets, typically 30–70 μm maximum dimension, which often show hexagonal morphology. Associated minerals are diopside, olivine, phlogopite, Ti-K-richterite, chrome spinel, ilmenite, priderite, and jeppite. Haggertyite has a magnetoplumbite-type structure. Typical microprobe analyses give (as wt% oxides) $\text{TiO}_2 = 36.5\text{--}41.6$, $\text{FeO} = 39.4\text{--}42.9$, $\text{MgO} = 0.7\text{--}3.6$, $\text{BaO} = 9.5\text{--}10.5$, $\text{K}_2\text{O} = 1.3\text{--}1.5$, $\text{Cr}_2\text{O}_3 = 0.0\text{--}5.6$, $\text{MnO} = 0.6\text{--}1.1$, and $\text{NiO} = 0.1\text{--}0.4$. The average composition (based on 19 O atoms and an $\text{Fe}^{2+}/\text{Fe}^{3+}$ ratio to give 12 small cations) is $\text{Ba}_{0.68}\text{K}_{0.31}\text{Ti}_{5.05}\text{Fe}_{3.91}^{2+}\text{Fe}_{2.01}^{3+}\text{Mg}_{0.69}(\text{Cr,Mn,Ni})_{0.34}\text{O}_{19}$. Haggertyite is hexagonal, space group $P6_3/mmc$, $Z = 2$, $a = 5.9369(1)$, $c = 23.3445(6)$ Å, calculated density of 4.74 g/cm³. The structure was refined to $R_1 = 0.034$ for 339 unique reflections with $F_o > 4\sigma_{F_o}$ using single-crystal data. Strongest reflections are [d_{calc} (Å), I_{calc} , hkl] 2.641 100% (114), 2.795 90% (017), 1.634 47% (02,11), 2.437 46% (023), and 2.963 44% (110). In reflected light, haggertyite is pale gray, opaque, and without internal reflections. It is not discernably pleochroic or birefractant, but it is weakly anisotropic in shades of dark brown. Quantitative specular reflectance measurements for R_o and R_e' in air and in oil immersion, respectively, are: 470 nm, 17.3, 16.9, and 5.37, 5.13%; for 546 nm 16.8, 16.35, and 5.19, 4.90%; for 589 nm 16.9, 16.3, and 5.29, 4.92%; and for 650 nm 17.1, 16.4, and 5.42, 5.00%. $\text{VHN}_{50} = 500$, with a range of five indentations = 460–540. The mineral is named for Stephen E. Haggerty in honor of his contributions to the mineralogy and crystal chemistry of upper-mantle titanate minerals.