

Nigelcookite, $\text{PbFe}_2^{2+}\text{V}_2^{3+}(\text{PO}_4)_3(\text{OH})_3$, and plumbojohntomaite, $\text{PbFe}_2^{2+}\text{Fe}_2^{3+}(\text{PO}_4)_3(\text{OH})_3$, two new members of the bjarebyite group from the Yushui Cu deposit, South China

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ABSTRACT

Two new minerals, nigelcookite, ideally $\text{PbFe}_2^{2+}\text{V}_2^{3+}(\text{PO}_4)_3(\text{OH})_3$, and plumbojohntomaite, ideally $\text{PbFe}_2^{2+}\text{Fe}_2^{3+}(\text{PO}_4)_3(\text{OH})_3$, have been found in the Yushui Cu deposit, South China. They occur in the bedded/massive Cu ore, and often occur in association with chalcopyrite, galena, sphalerite, nolanite, pyrite, anhydrite, apatite, fluorite, xenotime-(Y), and quartz. They are both new members of the bjarebyite group, exhibiting the general formula $XM_1M_2(\text{PO}_4)_3(\text{OH})_3$. Nigelcookite occurs as spearhead-shaped or platy crystals ranging from 5 to 100 μm in size, and plumbojohntomaite occurs as platy crystals ranging from 5 to 80 μm in size. Both minerals are translucent to transparent with vitreous luster, but they differ in color. Nigelcookite ranges from dark brown to greenish brown, while plumbojohntomaite varies from dark green to olive green. On the basis of 8 cations, the empirical formulas are $\text{Pb}_{0.98}(\text{Fe}_{1.69}^{2+}\text{Mn}_{0.24}\text{Cu}_{0.04}\text{Zn}_{0.03})_{\Sigma 2.00}(\text{V}_{1.31}\text{Fe}_{0.63}^{3+}\text{Al}_{0.06})_{\Sigma 2.00}(\text{PO}_4)_{3.02}(\text{OH})_3$ and $\text{Pb}_{1.03}(\text{Fe}_{1.91}^{2+}\text{Mn}_{0.02}\text{Cu}_{0.04}\text{Zn}_{0.03})_{\Sigma 2.00}(\text{Fe}_{1.95}^{3+}\text{V}_{0.05})_{\Sigma 2.00}(\text{PO}_4)_{2.97}(\text{OH})_3$ for nigelcookite and plumbojohntomaite, respectively. Both minerals are monoclinic, with space group $P2_1/m$ (#11) and $Z=2$. The unit-cell parameters are $a=9.1159(5)$ Å, $b=12.2328(7)$ Å, $c=5.0092(3)$ Å, $\beta=100.708(6)^\circ$, $V=548.86(6)$ Å³, and $Z=2$ for nigelcookite, and $a=9.0999(4)$ Å, $b=12.1911(6)$ Å, $c=5.0176(2)$ Å, $\beta=100.671(4)^\circ$, $V=547.02(4)$ Å³, and $Z=2$ for plumbojohntomaite.

Nigelcookite (IMA 2023-113) and plumbojohntomaite (IMA 2023-119) are approved by the International Mineralogical Association Commission on New Minerals, Nomenclature and Classification. They are isostructural with other minerals of the bjarebyite group, and nigelcookite is also the member of the group with V^{3+} as the dominant cation at the M_2 site. The negative correlation between V and Fe contents indicates isomorphic substitution between V^{3+} and Fe^{3+} in nigelcookite and plumbojohntomaite. Given the occurrence of Fe^{3+} in plumbojohntomaite, its formation condition is more oxidized than nigelcookite.

Keywords: Nigelcookite, plumbojohntomaite, new mineral, bjarebyite group, Yushui Cu deposit