Ferro-tschermakite from the Ploumanac'h granitic complex, Brittany, France: mineral description

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Abstract: The mineral description is provided for ferro-tschermakite, ideally $\left[\text{Ca}_3\text{Fe}_2^{2+}\text{Al}_2\right]^{+}\left(\text{Si}_6\text{Al}_2\text{O}_{22}\right)^{2-}$ (OH)$_2$. The type specimen has been found in the dump of the Bâtiment et Granit de Ploumanac'h northern granite quarry, La Clarté, Perros-Guirec, Ploumanac'h granitic complex, Brittany, France. The empirical formula derived from electron microprobe analysis and single-crystal structure refinement, is: $\left(\text{Na}_{0.25}\text{K}_{0.06}\right)_{2-0.37}\left(\text{Ca}_{1.08}\text{Fe}_{0.18}^{2+}\text{Mg}_{0.02}\text{Na}_{0.18}\right)_{2-2.00}\left(\text{Fe}_{2.84}\text{Mg}_{0.54}\text{Al}_{1.54}\text{Fe}_{0.01}\text{V}_{0.01}\text{Ti}_{0.01}\right)_{2-5.00}\left(\text{Si}_{6.15}\text{Al}_{1.85}\right)_{2-8.00}\text{O}_{22}\left(\text{OH}_{1.94}\text{F}_{0.06}\right)_{2-2.00}$. Ferro-tschermakite is biaxial (−), with $\alpha = 1.666(2)$, $\beta = 1.680(2)$, $\gamma = 1.690(2)$ and 2$V$ (meas.) = 84(1)$^\circ$, 2$V$ (calc.) = 79.8. The dispersity is medium ($r > v$), and the orientation is: $X^a = 9.5^\circ$ (in β acute), $Y^b$, $Z^c = 24.3^\circ$ (in β obtuse). The unit-cell parameters are $a = 9.759(6)$, $b = 18.0220(11)$, $c = 5.3299(3)$ A, $\beta = 104.826(1)^\circ$, $V = 906.27(9)$ A$^3$, $Z = 2$, space group C2/m. The strongest ten reflections in the X-ray powder pattern obtained from single-crystal data $d$ values in (A): $I$, $(h k l)$ are: 8.359, 100, (1 1 0); 2.708, 84, (1 5 1); 3.098, 55, (3 1 0); 2.552, 41, (0 6 1); 2.595, 41, (0 6 2); 2.959, 41, (0 6 1); 2.330, 33, (3 5 1); 2.159, 27, (2 6 1); 2.936, 27, (2 2 1); 3.338, 27, (1 3 1); 2.012, 24, (4 0 2); 3 5 1).

Key words: ferro-tschermakite; amphibole; electron-microprobe analysis; optical properties; powder-diffraction pattern; crystal-structure refinement; Ploumanac'h granitic complex; France.

1. Introduction

After the approval of the new scheme for the classification and nomenclature of the amphibole supergroup (Hawthorne et al., 2012), we have started a systematic investigation to find and characterize all the amphiboles with distinct compositions that have not yet been officially approved by IMA-CNMNC, and for which there is no proper reference in the official IMA list of minerals. We realized that the root-name “tschermakite”, with the ideal composition $\left[\text{Ca}_3\text{Mg}_3\text{Al}_2\right]^{+}\left(\text{Si}_6\text{Al}_2\text{O}_{22}\right)^{2-}$ (OH)$_2$, and its Fe-rich analogues are lacking proper modern characterization. We present in this paper the complete characterization of ferro-tschermakite, which was approved by the IMA-CNMNC vote 2016–116. The holotype ferro-tschermakite is deposited in the mineralogical collections of the Museo di Mineralogia of the Università di Pavia, catalogue number 2016–02.

2. Occurrence

Ferro-tschermakite was found in a specimen found in the dump of the Bâtiment et Granit de Ploumanac’h northern granite quarry, in the Ploumanac’h granitic complex, at La Clarté, Perros-Guirec, Brittany, France (∼48°48’50” N, ∼3°28’50” W; Fig. S1 in Supplementary Material attached to this article and freely available online on the GSW website of the journal: http://eurjmin.geoscienceworld.org/). The Ploumanac’h granite complex (or Ploumanac’h plutonic complex in Decitre et al., 2002), is located on the northern coast of Brittany, at the northern tip of the Trégor, between Trébeurden and Perros-Guirec. On the geological map of France at a scale of 1/1 000 000, the complex occurs at the northern end of the “red granites”, which extend from the end of Finistère (Aber-Ildut, Morlaix) in the southwest to the Cotentin peninsula (Flamanville and Barfleur) in the northeast. The Ploumanac’h complex is approximately 12 × 8 km in extent, and is concentrically zoned with an outer aureole (Fig. S2; Barrière, 1977). A reconstruction of geological setting, of magma composition and of the complex crystalization conditions is provided in Decitre et al. (2002). The Ploumanac’h complex intrudes: (i) the Trébeurden gneisess; (ii) the granite pluton of Perros-Guirec; (iii) the orbicular granite of Milliau Island (Decitre et al., 2002). The Perros-Guirec granite (Fig. S3) is a grey-pink granite batholith located east of the Ploumanac’h complex. It is a coarse-grained, porphyroid granite, where the pronounced pink colour is due to the presence of large feldspar crystals. It is