Celleriite, $\Box (\text{Mn}^{2+} \text{Al})\text{Al}_6(\text{Si}_6\text{O}_{18})(\text{BO}_3)_3(\text{OH})_3(\text{OH})$, a new mineral species of the tourmaline supergroup

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**Abstract**

Celleriite, $\Box (\text{Mn}^{2+} \text{Al})\text{Al}_6(\text{Si}_6\text{O}_{18})(\text{BO}_3)_3(\text{OH})_3(\text{OH})$, is a new mineral of the tourmaline supergroup. It was discovered in the Rosina pegmatite, San Piero in Campo, Elba Island, Italy (holotype specimen), and in the Pikárec pegmatite, western Moravia, Czech Republic (co-type specimen). Celleriite in hand specimen is violet to gray-blue (holotype) and dark brownish-green (co-type) with a vitreous luster, conchoidal fracture, and white streak. Celleriite has a Mohs hardness of ~7 and a calculated density of 3.13 and 3.14 g/cm$^3$ for holotype and its co-type, respectively. In plane-polarized light in thin section, celleriite is pleochroic (O = pale violet and E = light gray-blue in holotype; O = pale green and E = colorless in co-type) and uniaxial negative. Celleriite has trigonal symmetry: space group $R3m$, $Z = 3$, $a = 15.9518(4)$ and 15.9332(3) Å, $c = 7.1579(2)$ and 7.13086(15) Å, $V = 1577.38(9)$ and 1567.76(6) Å$^3$ for holotype and co-type, respectively (data from single-crystal X-ray diffraction). The crystal structure of the holotype specimen was refined to $R1 = 2.89\%$ using 1696 unique reflections collected with MoKa X-ray intensity data. Structural, chemical, and spectroscopic analyses resulted in the formulas:

$$X(\Box(\text{Mn}^{2+}_{0.58}\text{Na}_{0.42})_{2}\text{Al}_{2}(\text{Si}_{3.56\text{Fe}_{0.01}}^{2+}\text{Mg}_{0.01}\text{Al}_{1.14}\text{Fe}_{3+0.01}\text{Li}_{0.28}\text{Ti}_{0.01})_{23}\text{O}_{18})^{3-}\text{Al}_{4}[(\text{Si}_{1.59}\text{Al}_{1.01})_{25}\text{O}_{14}]^{4+}(\text{BO}_{3})_{3}(\text{OH})_{3}\text{w}[(\text{OH})_{0.65}\text{Fe}_{0.03}\text{O}_{0.32}]_{25.01}$$ (for holotype)

and

$$X(\Box(\text{Mn}^{2+}_{0.51}\text{Na}_{0.49})_{2}\text{Al}_{2}(\text{Si}_{3.57}\text{Fe}_{0.01}^{2+}\text{Al}_{1.16}\text{Fe}_{0.01}\text{Li}_{0.17}\text{Zn}_{0.04})_{23}\text{O}_{18})^{3-}\text{Al}_{4}[(\text{Si}_{1.57}\text{B}_{0.33})_{25}\text{O}_{14}]^{4+}(\text{BO}_{3})_{3}(\text{OH})_{3}\text{w}[(\text{OH})_{0.35}\text{Fe}_{0.03}\text{O}_{0.48}]_{25.01}$$ (for co-type)

Celleriite is a hydroxy species belonging to the X-site vacant group of the tourmaline supergroup. The new mineral was approved by the Commission on New Minerals, Nomenclature and Classification of the International Mineralogical Association, proposal no. 2019-089.

In the Rosina pegmatite, celleriite formed an overgrowth at the analogous pole of elbaite–fluor-rossmanite crystals during the latest stage of evolution of pegmatite cavities after an event of a pocket rupture. In the Pikárec pegmatite, celleriite occurs as an intermediate growth sector of elbaite, prinivalleite, and fluor-rossmanite.

**Keywords:** Celleriite, tourmaline, crystal-structure refinement, electron microprobe, Mössbauer spectroscopy, laser-induced breakdown spectroscopy, laser-ablation inductively coupled plasma mass-spectroscopy, Raman spectroscopy; Lithium, Beryllium, and Boron: Quintessentially Crustal

**Introduction**

Tourmaline minerals are reported to be the first boron minerals to have formed in Earth’s crust and now are the most widespread of minerals for which boron is an essential constituent (Grew et al. 2016; Dutrow and Henry 2018). It is no surprise that this supergroup receives an ever-increasing interest from the geoscience community. Tourmaline minerals are complex borosilicates that have been extensively studied in terms of their crystal structure and crystal chemistry (e.g., Foit 1989; Grice and Ercit 1993; Ertl et al. 2002, 2018; Novák et al. 2004, 2011; Bosi and Lucchesi 2007; Bosi 2013, 2018; Henry and Dutrow 2011; Henry et al. 2011; Filip...