

Mazzite-Na, a new zeolite from Boron, California: Its description and crystal structure

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ABSTRACT

Mazzite-Na, $\text{Na}_8\text{Al}_8\text{Si}_{28}\text{O}_{72}\cdot 30\text{H}_2\text{O}$, is a new zeolite mineral species occurring in basalt at the bottom of the open pit of the U.S. Borax mine at Boron, California. It crystallizes as white, very thin, flexible fibers up to 2 mm in length, and commonly fills small cavities as satiny mats. The luster is vitreous, and the streak is white. The fineness of the fibers precludes the determination of the hardness and the observation of any cleavage. The observed and calculated densities are 2.16 and 2.18 g/cm^3 , respectively. The mineral is uniaxial positive with $n_e = 1.472(3)$ and $n_o = 1.471(3)$. Electron-microprobe analyses yielded (in wt%) SiO_2 57.65, Al_2O_3 14.35, Fe_2O_3 0.65, MgO 0.22, CaO 0.18, BaO 0.14, Na_2O 8.07, K_2O 0.03, and H_2O 18.70 (TG analysis), which gives the empirical cell contents $(\text{Na}_{7.52}\text{K}_{0.02}\text{Mg}_{0.16}\text{Ca}_{0.09}\text{Ba}_{0.03})[\text{Fe}_{0.24}\text{Al}_{8.13}\text{Si}_{27.71}\text{O}_{72}]\cdot 29.98\text{H}_2\text{O}$. Mazzite-Na is hexagonal, $P6_3/mmc$, $a = 18.2343(7)$, $c = 7.6371(2)$ Å, $Z = 1$. The strongest seven measured X-ray lines [d in Å(hkl)] are: 9.08(100)(110), 6.86(70)(101), 5.95(70)(210), 4.681(40)(211), 3.787(80)(002), 3.511(40)(112), and 3.150(70)(500).

The framework consists of columns of gmelinite cages parallel to c , cross-linked to form two types of channels; one has an elliptical 8-ring cross section and the other has a circular 12-ring cross section. The extra-framework Na cations are located at three different sites. NaI is at the center of the 6-ring between adjacent gmelinite cages and is coordinated by six framework oxygen atoms and two H_2O molecules. NaII lies on the centerline of the 8-ring channel and is coordinated by four framework oxygen atoms and two H_2O molecules. NaIII occupies sites along the walls of the 12-ring channel and is coordinated with two framework oxygen atom and four H_2O molecules.

With the naming of this mineral for its Na dominant composition the original mineral is renamed mazzite-Mg, and the name mazzite is raised to series status.