

**THERMAL BEHAVIOUR OF THE NEW MINERAL CAIRCROSSITE,  
 $\text{Sr}_2\text{Ca}_7(\text{Si}_4\text{O}_{10})_4(\text{OH})_2 \cdot 15\text{H}_2\text{O}$ .**

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The name Cairncrossite is given to a new mineral characterized with the formula  $\text{Sr}_2\text{Ca}_7(\text{Si}_4\text{O}_{10})_4(\text{OH})_2 \cdot 15\text{H}_2\text{O}$ . It occurs as white, micaceous crystals lining vughs in manganese ore from the Wessels Mine, Kalahari Manganese Field, South Africa., well known for the occurrence of new and rare minerals (e.g. GIESTER & RIECK, 1996). It is associated with richterite, manganoan sugilite, pectolite and represents the last formed mineral due to metasomatic alteration of the primary, carbonate-rich manganese minerals within the calc-silicate skarn assembly.

The atomic arrangement of the triclinically distorted, pseudo-hexagonal crystal structure –  $P1$ ,  $a = 9.624(2)$ ,  $b = 9.634(2)$ ,  $c = 15.657(3)$  Å,  $\alpha = 100.80(1)$ ,  $\beta = 91.22(1)$ ,  $\gamma = 119.80(1)$  °,  $V = 1226.2(4)$  Å<sup>3</sup>,  $Z = 1$  – can be classified as a phyllosilicate with layers parallel to (001). This main structural motif can be described as a brucite-like sheet of edgesharing  $\text{CaO}_4(\text{OH})_2$  octahedra sandwiched by single layers of  $\text{SiO}_4$  tetrahedra, i.e. unbranched vierer single layer (LIEBAU, 1985), which exhibit two conformations of six-membered rings. Between these layers dimers of  $\text{SrO}_2(\text{O}_w)_6$  polyhedra are intercalated together with hydrogen bonded water molecules. Minerals with a similar structural motif are found in the gyrolite and reyerite groups, which inevitably lead to the class of calcium silicate hydrates (CSH) playing an essential role in the strong exothermic hydration of Portland cement (TAYLOR, 1964).

During the routine thermal analysis of cairncrossite the mineral exhibit a two-phase endothermic loss of the 15 water molecules in the range 25 – 400 °C, followed by a small endothermic event with endset around 570 °C and a significant endothermic weight loss at 700 °C, which coincides to a dehydroxylation of the material. Due to the bonding scheme of the intercalated Sr-polyhedra a complete structural disintegration on dehydration would be anticipated, however, the mineral exhibits a full rehydration capability up to 400 °C. The further heating revealed the formation of a Sr-substituted CSH phase comparable to  $\text{Ca}_7\text{Si}_{16}\text{O}_{38}(\text{OH})_2$ , also known as K-phase (GARD et al., 1981). After dehydroxylation the K-phase decomposes to wollastonite-2M and an up to now unknown compound.

These thermogravimetric studies (TGA, DSC) and in situ high-temperature X-ray powder diffractometry of the new mineral cairncrossite will be presented and discussed.

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