The starkeyite-bearing specimen was collected by the writer in a dump area at the now-defunct Alta troilite mine, Del Norte County, California. Starkeyite (MgSO₄ · 4H₂O) occurs mainly as a cream-colored fine-grained efflorescence on the troilite, but also forms veins in it. A combination of gravimetric and electron probe methods was used in the analysis, which is MgO 17.5, FeO 4.5, SO₃ 41.0 and H₂O 36.0, summation 99.0 weight per cent. Qualitative tests give a strong reaction for Fe²⁺, and all iron is assumed ferrous in calculating the formula, which, on the basis of 4.00 H₂O (one-quarter the unit cell) is: Mg₀.₈₆Fe₀.₁₂(SO₄)₁.₀₂(H₂O)₁.₀₀. Physical data are intermediate to the pure iron and magnesium compounds, but closer to magnesium sulphate. X-ray data are a 5.93(2), b 13.62(2), c 7.91(1)Å and β 90°51' ± 1°. Intensities of lines are similar to the pattern given for synthetic starkeyite by Hodenberg & Kühn (1967), the d-spacings being somewhat enlarged compared to the iron-free compound.

The Del Norte starkeyite, when collected, may have contained more or less than 4(H₂O), depending on the conditions of temperature and humidity then applying. The mineral as analyzed is, however, stable under the laboratory conditions in which the specimen was stored for several years: temperature 21 °C and relative humidity 45 ± 5%. The electron probe data and the x-ray powder diffraction results both indicate the mineral is a true intermediate member of the Fe-Mg sulphate tetrahydrate series, and not just a mechanical mixture of iron and magnesium sulphates.

This mineral is essentially MgSO₄ · 4H₂O. The writer has recently obtained approval from the IMA Commission to use starkeyite for this composition because another name (leonhardtite) was also available, a situation which came about as follows. Starkeyite was named by Grawe (1945, pp. 209-210) who, on the basis of x-ray data and qualitative tests for iron, thought the mineral was FeSO₄ · 4H₂O. Subsequent partial analysis of the type material at the U.S. Geological Survey, however, showed minor FeO and abundant MgO, suggesting starkeyite was a magnesium instead of an iron sulphate. Accordingly, some years later, Grawe (1956) transferred the name to MgSO₄ · 4H₂O, allowing that his initial error was due to association of the new mineral with pyrite, and similarity of its x-ray pattern to FeSO₄ · 4H₂O. Meanwhile Berdesinski (1952) had identified, apparently by x-ray data alone, a natural occurrence of MgSO₄ · 4H₂O, naming it leonhardtite. Fleischer (1957) later pointed out, however, that to avoid confusion with the zeolite leonhardtite, starkeyite should be used for MgSO₄ · 4H₂O, and this usage has now been approved.

Some other occurrences of starkeyite are noted by Garavelli (1957), Proshchenko (1959), and Calleri et al. (1968). Hodenberg & Kühn (1967) found that, of eleven natural efflorescences on kieserite (MgSO₄ · H₂O) from Stassfurt salt, eight were starkeyite.

REFERENCES


