

**First reported occurrence of schwertmannite related to acid rock drainage (ARD)
from the Halifax slates, Nova Scotia**

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Schwertmannite [$\text{Fe}_8\text{O}_8(\text{OH})_6\text{SO}_4$] is a secondary iron oxyhydroxysulphate mineral associated with acid rock drainage (ARD) that results from sulphide oxidation. In the past, secondary iron minerals have been loosely termed “amorphous ferric hydroxide” and are grouped under the general term “ochre deposits”. Mainly, this has been because of their very fine grain size and poor crystallinity, which has led to difficulty in characterizing their crystal structure and chemical formula. Recently, it has been recognized that ochre deposits related to ARD are composed of identifiable minerals such as jarosite, ferrihydrite, goethite and schwertmannite. Each of these minerals has its own distinct crystal morphology, size and degree of crystallinity. These characteristics, in turn, are known to be important controls for the activity of iron, as well as several other environmentally significant trace elements such as Cu, Pb, Cd, etc. Therefore, it is important to identify each individual phase present in such secondary deposits.

Schwertmannite occurs in an ochre accumulation, approximately 25 km north of the city of Halifax, Nova Scotia. The ochre occurs as a reddish precipitate on the surface of semi-submerged rock fragments in a small pond at the base of a quarry, that exploited black slates of the Halifax Group, Meguma Supergroup. The mineral is associated with ARD formed from disruption and oxidation of sulphide minerals (pyrrhotite and pyrite) in the black slates. Two pH measurements of the water in the pond gave values of 2.69 and 2.72 (June 20, 1995). The mineral has the typical fibrous or “pin-cushion” morphology described for schwertmannite deposits elsewhere. Its XRD pattern is characterized by eight broad peaks with d-spacings between 1.4 and 5.3 Å. The fibrous crystals coalesce to form larger, spherical aggregates and, in places, encapsulate bacterial cells. It is likely that crystallization resulted from the microbial oxidation of Fe^{2+} .