Wisconsin Wavellite

When rock hounds think of wavellite, they usually think of the green "lime slice" clusters from Arkansas. But wavellite occurs in other places, including Wisconsin. The Wisconsin material, although not as attractive as that from Arkansas, provides a valuable lesson in how this mineral forms.

Wavellite is a hydrated aluminum-rich phosphate. The Wisconsin wavellite occurs as cream colored botryoidal to stalactitic crusts within sandstone of the Eau Claire Formation (Klemic and Mrose, 1972). It is found at the base of a long mound extending from Merillan to Black River Falls, Jackson County, Wisconsin. In these places scattered wavellite specimens can be collected on hill slopes or in low roadcuts.

I became interested in this occurrence because I thought wavellite might be widespread within this formation. The wavellite is inconspicuous and easily overlooked by someone unaware of its presence. A student at U.W.R.F., Candy Schwantes, began work by specifically looking for wavellite at many localities where the Eau Claire Formation is exposed in western Wisconsin. After surveying over 40 spots, the Merrillan-Black River Falls sites were still the only places where wavellite was found. We concluded that its formation must relate to local, rather than regional, conditions.

One thing that struck both Candy and I about the wavellite area was the spots of intense red coloration in the sandstone overlying the wavellite occurrences. This red coloration was iron oxide formed by the breakdown of pyrite or marcasite. As a result, sulfuric acid is released. This sandstone also contains fossil shell fragments made of the phosphate mineral, apatite. Suppose the sulfuric acid dissolved some shells, releasing phosphorous. If the acidic, phosphorous-rich groundwater encountered clay minerals, which bear aluminum, all the ingredients for wavellite would be present, and the mineral might precipitate. This would be a local condition, found only where this particular combination of factors occurred.

To test this hypothesis, we decided to see if apatite shells would dissolve in sulfuric acid. We took shells from the Eau Claire sandstones and put them in various concentrations of sulfuric acid. In most solutions the shells dissolved - but in some dilute solutions a new white material began to precipitate. It was wavellite! It turned out that some of the shells still had clay on them. We had created the same
environment in the beaker that we thought occurred in the rocks and wavellite had formed.

This doesn't prove that this is how the Wisconsin wavellite forms, but it supports the hypothesis. It also helps illustrate the kind of chemical, physical, and geological conditions that have to interact to form the minerals we all enjoy.

- Dr. Bill Cordua, University of Wisconsin-River Falls

References:
