

## **Crystal chemistry in the attic: Differentiating commercial vermiculite from Libby, Montana from other commercial vermiculites on the basis of “whole-rock” chemical analysis**

In the fall of 1999, the small town of Libby, Montana gained national media attention because of asbestos contamination resulting from a vermiculite mining operation. A local vermiculite mine operated from the 1920's to 1990 and was the world's largest producing vermiculite mine. The vermiculite ore from the mine was heated to produce an expanded commercial product used widely as insulation and as a soil amendment. However, the ore contained trace amounts of amphibole-asbestos. The media linked the asbestos to early deaths of almost 200 employees of the former mine. Fear spread from the several hundred miners to the several thousand residents of the community, and now there is nationwide concern that people in an estimated 10 million homes across the USA that used Zonolite (the commercial name applied to expanded vermiculite from Libby) as attic insulation are in danger. Other mines, notably in South Carolina and South Africa, also produce commercial vermiculites, but ore from these mines do not appear to pose a similar health risk because they do not contain amphibole-asbestos. Currently there is a need to differentiate the potentially harmful commercial vermiculite produced from the Libby ore from other commercial vermiculites to minimize possible future remediation costs and minimize public fear.

We collected samples of vermiculite from the former Libby mine site, obtained a sample of commercial vermiculite (i.e., Zonolite) whose source was known to be Libby ore, collected samples from three home attics in the Moscow, Idaho area, and purchased seven commercial vermiculites from local garden supply stores. Standard XRF (X-ray fluorescence) methods, performed at the GeoAnalytical Laboratory, Washington State University, were used to obtain whole-rock chemical analysis to determine major and trace element composition for all 12 samples. Based on this preliminary screening of a somewhat limited sample set, the Libby samples were easily distinguished from other commercial vermiculites. For instance, the Libby samples were 3-4 times higher in Cr, V, and Ba trace elements and 1 to 2 weight percent higher in FeO. The samples collected from the local attics all appear to be produced from the Libby ore.