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RECEIVED MAY 5 1977

GEORGE LEE

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G. Lee

RECEIVED MAY 2 1977 W.M.I.

29 April 1977

Roger Miller
Windsor Minerals, Inc.
Windsor, Vermont 05089

Dear Roger:

I have read "Pitfalls in X-ray Diffraction Methods of Analysis for Impurities in Talc Powders," by J.B. Krause and W.H. Ashton. If I apply the same standards that would be used in reviewing a paper for publication in a professional journal, I believe that the language needs refinement and tightening. The organization could be improved, and referencing should be more detailed. For example, I see no reference to the Gandolfi method for XRD.

But the science is good. The authors correctly identify specimen flatness and placement tangent to the focussing circle as critical factors in accurate measurements of d. Many accomplished diffractionists are unaware of the need for this care. A displacement of 0.1 mm of the sample surface can lead to errors of 0.1°2θ, with modern diffractometers.

The authors correctly stress that it is fruitless to attempt amphibole species identification on the basis of the reflection at ∿8.4Å. The amphibole group is very complicated chemically, and hence in terms of nomemclature, yet the structure is sufficiently similar throughout the group so that identifications based on a few lines are meaningless.

The authors point out the danger of identification based on a single peak. Again, this technique is risky. Silicate minerals all have lattice planes in great abundance whose spacings are of the order of 1.5 to 4Å. However, considerably more meaning can be attached to very large d single reflections such as the chlorite(001) at 14.2Å. A reflection there can only be (among the common silicate minerals) vermiculite or chlorite. The authors correctly stress the need to look for this reflection in separating the effects of chlorite from serpentine or kaolinite. Unfortunately, though, some minerals provide only one peak of detectable (in mixtures) intensity. These are the rhombohedral carbonates, but they are not discussed in the paper.

I cannot speak so authoratatively on the morphological varieties of talc and amphibole, but their observations are in good accord with my own experience.

I must agree with their conclusions that diffraction patterns of mixtures of 14A (chlorite and/or vermiculite) and 7A (kaolinite, serpentine) minerals are almost impossible to interpret unless the minerals happen to be well crystallized and of high abundance so that many reflections are present. Even then, some varieties will give anomalous results. For example, iron-rich chlorite has a very weak (001) and can be easily confused with serpentine or Kaolinite. In addition, the ranges of unit cell parameters for these minerals overlap, so that only some species can be confidently identified, either separately or in mixtures. The authors criticize using the quartz (211) to determine quartz in talc samples. This approach is so poor that I am surprised that anyone has used it.

In summary, I find that the paper gives good evidence that the authors know their business. Each "pitfall" is a valid criticism of X-ray methods. I strongly agree with their conclusions that standard powder X-ray diffractometry cannot always provide accurate information on the kinds and amounts of minerals that are found in talc ores and talc products.

Sincerely,

RC Reynolds (Bob)

R.C. Reynolds, Jr.
Professor of Geology