DISCUSSION OF "X-RAY DIFFRACTION PATTERNS OF ASBESTOS"

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In a recent paper, "*X*-ray Diffraction Patterns of Asbestos," *Am. Mineral.*, **35**, 579–589 (1950), Suzanne van Dijke Beatty compared the *x*-ray diffraction patterns of several different types of asbestiform minerals with the purpose of providing data for the identification of these minerals by means of *x*-rays. Misinterpretations of the data were made because four of the samples studied were improperly identified. Since, in our opinion, the correction which appeared on page 1090 of the November–December 1950 issue is inadequate, we herewith review in greater detail the results reported.

According to our interpretation of Dr. Beatty's data, the four minerals referred to as chrysotile in Tables 6, 7, 8, and 9, are actually amphiboles of the tremolite type. These are the samples which are labeled as being from (1) Corsica, (2) Easton, Pa., (3) Labrador, and (4) Chester, Pa. The *d* values and measured intensities reported for these samples by Dr. Beatty agree very well with the data given by Johansson for grammatite, a comparatively pure tremolite.[1] To show how the *d* values remain virtually unchanged by isomorphic replacements in the tremolite structure, the data obtained by *x*-ray analysis of a synthetic fluor-amphibole containing 12 per cent Al_2O_3 is also reported. These data are compared in Table 1 with the results given by Beatty.

Dr. Beatty correctly grouped together the diffraction patterns of the misidentified samples and noted differences between them and the patterns obtained from the true chrysotiles. Since Dr. Beatty observed that the *d* values of the eight chrysotile-labeled samples could be arranged into two distinct groups, it is rather surprising that chemical analyses or petrographic examination of samples from each of these groups were not given. It is to be expected that such studies would have shown clearly the marked compositional and optical differences which exist. When *x*-ray data are presented which are to be used as a reference, it is highly desirable, and usually essential, to report the degree of homogeneity and the optical constants of the material. When this knowledge is used in conjunction with the chemical analysis the significance of every line in the pattern may be better understood.

When the 4 amphibole samples are discounted, the interplanar spacings of chrysotile do not show the considerable variations claimed. The two

[1] Johansson, K., Vergleichende Untersuchungen an Anthophyllit, Grammatit, und Cummingtonit: *Zeit. Krist.*, **73A**, 31–51 (1930).

TABLE 1. COMPARISON OF *X*-RAY DIFFRACTION DATA OF NATURAL AND SYNTHETIC TREMOLITE WITH MISIDENTIFIED "CHRYSOTILE"

Labrador[1]		Natural Tremolite (Grammatite[2])		Synthetic Fluorine-Containing Amphibole[3]		Miller Indices
d Å. U.	Meas. Int.	*d* Å. U.	Meas. Int.	*d* Å. U.	Meas. Int.	
9.0	6			9.0	7	020
8.4	19	8.41	3	8.4	29	110
4.51	4	4.50	2	4.48	8	040
3.37	8	3.38	2	3.38	9	220
3.27	10	3.27	2	3.25	16	240
3.12	32	3.13	4	3.10	43	310
2.94	9	2.94	2	2.94	9	221
2.80	4	2.80	2	2.78	10	330
2.71	16	2.71	4	2.70	16	151
2.67	7					
2.60	6	2.59	2	2.59	8	061
2.54	8	2.52	3	2.53	7	$\bar{2}02$
2.34	10	2.33	2	2.32	7	$\bar{3}51$
2.28	4	2.26	1	2.254	2	$\bar{3}12$
2.169	9	2.16	2	2.161	8	261
2.043	5	2.04	1	2.058	2	202
2.017	8	2.01	2	2.015	5	$\bar{4}02$
1.897	5					
1.653	8	1.65	2	1.645	9	461
1.585	$5\frac{1}{2}$	1.573	2	1.580	3	$\bar{1}53$
1.514	4	1.506	2			
1.505	4	1.503	2	1.497	5	$\bar{2}63$
1.440	10	1.436	3	1.449	4	$\bar{6}61$
1.366	3	1.355	2	1.344	3	710
1.313	3	1.308	1	1.310	2	$\bar{7}51$
1.295	3	1.292	2	1.290	3	$\bar{2}.12.2$

[1] Data reported by Suzanne van Dijke Beatty. The results reported for the other erroneously identified samples agree closely with these data and, therefore, are not repeated here. Some minor lines have been omitted from this table.

[2] Results obtained by K. Johansson, Vergleichende Untersuchungen an Anthophyllit, Grammatit, and Cummingtonit: *Zeit. Krist*, **73A**, 43 (1930). Intensities reported in this instance rated from 5 for very strong to 1 for weak.

[3] Fluor-amphibole prepared at the Electrotechnical Laboratory, U. S. Bureau of Mines in its current program on the synthesis of the asbestiform minerals. Chemical analysis of this aluminum-containing amphibole is as follows: SiO_2 50.95%, Al_2O_3 12.48%, MgO 19.95%, CaO 12.71%, and F 6.34%. This approximates the formula $Ca_2(Mg_4Al)(AlSi_7)O_{22}F_2$. More detailed information on synthetic fluor-amphiboles will appear at a later date.

strongest lines in the chrysotile patterns, the (200) and (400) reflection, have d values of 7.3 ± 0.1 and 3.65 ± 0.03 Å.U.

THE NOMENCLATURE OF CLAY MINERALS

At the International Soil Science Congress held in Amsterdam (July 26–August 1, 1950) a special meeting to discuss the nomenclature of clay minerals was held which was attended by a representative number of workers in this subject. The following were discussed:

1. *ILLITE.*

Professor R. E. Grim emphasized the non-specific character of this term when it was first applied to mica-clay minerals. Following a discussion on the relation of such minerals to micaceous minerals containing randomly interstratified layers of other types, it was generally agreed that illite should be used as a general, non-specific, term for mica-clay minerals (both di- and tri-octahedral types, i.e., heptaphyllites and octaphyllites) which show no significant swelling characteristics and which give a first order, basal reflection of about 10Å which is unaffected by mild chemical and/or thermal treatments.

HYDROUS MICA was suggested as a convenient general term to cover both illites and mixed-layer minerals such as bravaisite, hydrobiotite, etc.

2. *HALLOYSITE, METAHALLOYSITE, ENDELLITE.*

The confusion which exists in the use of these terms and which generally requires the use of additional explanatory words or phrases was discussed, and the general feeling of the meeting was that great simplification and clarification would result if the word 'halloysite' were employed for all forms of the mineral. When necessary, additional self-explanatory qualifications could be used such as: fully hydrated, partially hydrated, dehydrated, glycol-halloysite, halloysite à 7Å, etc. . . .

It was unanimously recommended that the use of endellite should be discontinued.

After some discussion, it was also agreed, though less emphatically, to discontinue the use of metahalloysite; the view was expressed that the prefix 'meta' had no very clearly defined significance in mineralogy. The question has since been raised again in writing, firstly by Dr. D. M. C. MacEwan who, after looking into this question finds "numerous precedents for such a usage," and subsequently by Professor C. W. Correns who also finds many examples of meta-minerals which are dehydrated forms. Although these additional points cannot now be discussed by all who attended the meeting, it is probable that if they had been available, a majority of those present would have agreed to the continued use of metahalloysite as a convenient term for the largely dehydrated form which occurs naturally. It was emphasized by Dr. G. W. Brindley that the range of basal spacings exhibited by natural metahalloysites shows that they are rather variable materials. Therefore, even if metahalloysite is retained as a convenient term for naturally occurring materials, it does not remove the need for employing more precise qualifications when more precisely defined forms are under consideration.

3. *THE KAOLIN GROUP OF MINERALS.*

Dr. G. W. Brindley suggested that the group comprising kaolinite, dickite, nacrite, halloysite, etc., should be called the 'kaolin group' to avoid the confusion which may arise if the name of one member of the group (generally kaolinite) is also applied to the whole group. No confusion can arise with the use of kaolin as a rock name, since such a rock is simply one which is rich in kaolin minerals. This suggestion was received with general approval.

4. *MONTMORILLONOID GROUP.*

Dr. D. M. C. MacEwan pointed out that the use of montmorillonite in three different senses leads either to confusion or to an unwieldy qualification of the term. At present

montmorillonite is used for (*a*) the particular mineral from Montmorillon which is highly siliceous, (*b*) aluminous minerals generally of this type, and (*c*) all minerals of this type including nontronite, saponite, ... To avoid this confusion and also the lengthy term "minerals of the montmorillonite group" when the group as a whole is implied, the term "montmorillonoid" was suggested for this group of minerals. Montmorillonite can then be restricted to sense (*b*), with (*a*) as a particular case of (*b*).

There was considerable difference of opinion on this point and some adverse criticism on the ground that the termination 'oid' did not necessarily suggest a mineral akin to montmorillonite, c.f., chlorite and chloritoid. Professor C. W. Correns has suggested the term 'montmorin' for this group of minerals, which is similar to 'kaolin.' Montmorillonoid, however, has been employed in the Monograph "*X*-ray Identification and Structures of Clay Minerals" (Edited by G. W. Brindley, to be published by The Mineralogical Society), and whether or not it will be generally adopted remains to be seen.

G. W. Brindley (*Chairman*), and D. M. C. MacEwan (Great Britain), S. Caillère (France), C. W. Correns (Germany), J. Ch. L. Favejee (Holland), and R. E. Grim (U.S.A.).

ENROLLMENT OF GEOLOGISTS AND GEOPHYSICISTS IN THE NATIONAL SCIENTIFIC REGISTER

David M. Delo

Planning for the mobilization and effective use of the scientists and engineers of the United States for purposes of national defense is now under way. Appointment of a committee composed of leaders in science and industry by the National Security Resources Board is a recent step. The representative of the geological professions on this committee is E. De Golyer; the chairman is Charles A. Thomas, vice-president of Monsanto Chemical Co. and former president of the American Chemical Society.

A basic element in the entire program for maximum use of the nation's scientific manpower will be an adequate scientific register. This will tell us the magnitude and nature of the national pool of technological competence.

In order to secure this information, the N.S.R.B. was instrumental last summer in causing the establishment of a National Scientific Register Office in the U. S. Office of Education. This office has let contracts with the American Chemical Society, the National Research Council and the American Institute of Physics for enrollment of all physical and biological scientists and mathematicians. Enrollment will be accomplished through the societies and the register will also be kept up to date through the societies. The American Geological Institute has been asked to ensure the enrollment of all geologists and geophysicists.

The project must start essentially from scratch because the records of the World War II National Roster are completely out of date. Also, with the tremendous increase in the number of working scientists since 1945, its records are very incomplete.

Some geologists and geophysicists who are included in American Men of Science, filled out a comprehensive registration form in 1948. These men *will not* be asked to answer all the questions on the new simpler form, but will be asked to fill out basic questions in the interest of uniformity.

The following methodology is being established for this project to ensure effective coverage. It is hoped that use of this method will spread the work, prevent wasteful and annoying duplication, and get the job done more promptly and effectively.

1. The register will include all geologists and geophysicists with a bachelors degree (or equivalent) and all graduate students.

2. Circularization will be accomplished by district committees. These will center in active local societies, state geological surveys and major departments.
3. Each committee will be responsible for full circularization in its district, and has been asked to estimate the number of forms required for this purpose.
4. Franked envelopes requiring no postage, will be utilized. Where possible, these will be pre-addressed.
5. Each form will be accompanied by a careful instruction memorandum.
6. A card file will be maintained in AGI headquarters showing which forms have been completed and certain other pertinent data. The register will be used for the following purposes—
   (a) by Scientific Advisory Committees in the Selective Service System. It is expected that these committees will review appeals for deferment which are made to the President and that the information on file with the Register will be used in the consideration of such cases.
   (b) by the National Security Resources Board. This agency is charged with responsibility for the planning of general mobilization both military and civilian, and will use the information in determining the requirements for scientific manpower in various activities.
   (c) by the National Research Council and by the American Geological Institute in determining the distribution and availability of earth scientists among the various specialized occupations.
   (d) as a means whereby Government agencies may identify personnel with specialized training or experience for unusual work requirements.
   (e) in the preparation of studies and recommendations to Government agencies, such as the National Security Resources Board, concerning the needs for geological scientists in civilian occupations.

In addition, it will furnish information concerning the composition and structure of the geological professions which will be invaluable.

The full cooperation of every member of the geological profession is earnestly requested so that our part in this national effort may be performed quickly and effectively.

The 25th Jubilee Meeting of the Swiss Mineralogical and Petrographical Society was held at Davos, Switzerland, on August 26–28, in connection with the annual assembly of the Swiss Natural History Society. During the first two days scientific sessions were held at which a number of papers were presented. The opening address, given by Professor Paul Niggli of Zürich, was entitled "Probleme der Alpine Metamorphose." The third day was marked by a visit to the Institute for Snow and Avalanche Research on the summit of Weissfluhjoch and a jubilee luncheon there at which congratulations were extended to the society in French, German, English, Italian and Finnish. The presidential address was given by Dr. R. Galopin of Geneva. That evening at a general assembly of the Swiss Natural History Society, Dr. M. De Quervain, Director of the Weissfluhjoch Institute, spoke on "Metamorphose der Schnee." Opening and closing dinners also were held together with the Natural History Society. About 120 persons attended the Jubilee Meeting. These represented 23 different countries. From the United States were present Wm. F. Bradley, Illinois State Geological Survey, A. E. Engel, California Institute of Technology, R. E. Grim, University of Illinois, and E. Wm. Heinrich, University of Michigan, delegate of the Mineralogical Society of American.

Two 8-day field excursions preceded the meetings and two more of similar length followed the assembly. All were well attended and unusually well organized and conducted.

Of particular interest to mineralogists was the later general mineralogical and petrographical excursion through the Alps which had as leaders P. Niggli, C. Burri, R. L. Parker, M. Vuagnat, E. Wenk, and E. Niggli.

E. Wm. Heinrich

During the 1950 general meeting of the German Mineralogical Society held in Göttingen during the end of August, a "Section for Crystal Knowledge," which was established by a group of interested scientists, was included within the scope of the Society. Professor H. O'Daniel, of the University of Frankfort, who was elected director of the section, thus also becomes one of the two vice presidents of the German Mineralogical Society. In the "Section for Crystal Knowledge" the Society wishes to cultivate those subjects which extend beyond the borders of mineralogical problems alone and concern themselves with the growth and properties of all solid crystalline bodies. In this way the Society hopes to be placed in close contact with students of the allied sciences, mathematics, physics and chemistry. It is planned to hold an annual meeting for the presentation of papers as a means by which these contacts may be especially maintained. (*Translation by E. Wm. Heinrich from Deutsche Mineralogische Gesellschaft.*)