THE DEVELOPMENT OF TWINNING IN THE DEHYDRATION OF BRUCITE

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Research carried out on the structure of dehydrated brucite has shown (1), (2), (3) that the MgO crystals, formed at the expense of the $Mg(OH)_2$, have an orientation related to that of the brucite. The MgO crystals adopt two different orientations that are as follows:

Orientation I			*Orientation II*		
$Mg(OH)_2$		MgO	$Mg(OH)_2$		MgO
$\{0001\}$	$\parallel$	$\{111\}$	$\{0001\}$	$\parallel$	$\{111\}$
$\{10\bar{1}0\}$	$\parallel$	$\{011\}$	$\{10\bar{1}0\}$	$\parallel$	$\{011\}$
$\{10\bar{1}1\}$	$\sim\parallel$	$\{001\}$	$\{1\bar{1}01\}$	$\sim\parallel$	$\{001\}$.

The two orientations correspond to those of the two members of a spinel twin. A dehydrated crystal of brucite is an assemblage of MgO crystals with two different orientations; it is a typical case of transformation twins.

I have studied, by means of the diffration of *x*-rays, the development of these twins as a function of the degree of dehydration. A crystal of brucite (from Texas) was heated at a constant temperature for a period of time, and from its loss of weight the amount of water driven off was determined. The crystal in different states of dehydration was studied by the rotating crystal method and by Weissenberg photographs. Figure 1 shows the curve of dehydration obtained at 500° C with a crystal of size $3\times0.7\times0.3$ mm.

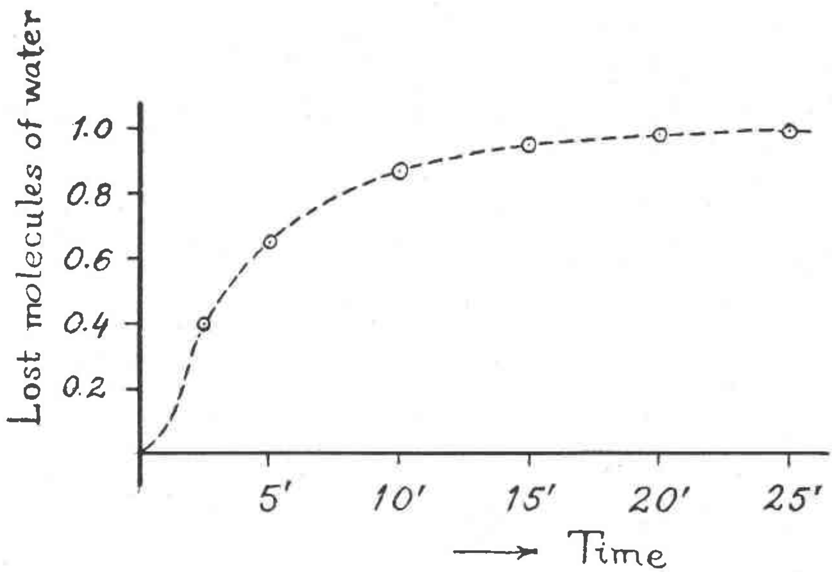

FIG. 1

On the x-ray diagrams we can easily see the reflections due to the presence of either of the phases. The reflections of the $Mg(OH)_2$ are sharp, while those of the MgO appear widened and diffuse due to the reduced size of the crystallites of the oxide. Figure 2 shows a Weissenberg photograph of a partially dehydrated crystal in which the reflections of the brucite can be seen together with those of the MgO.

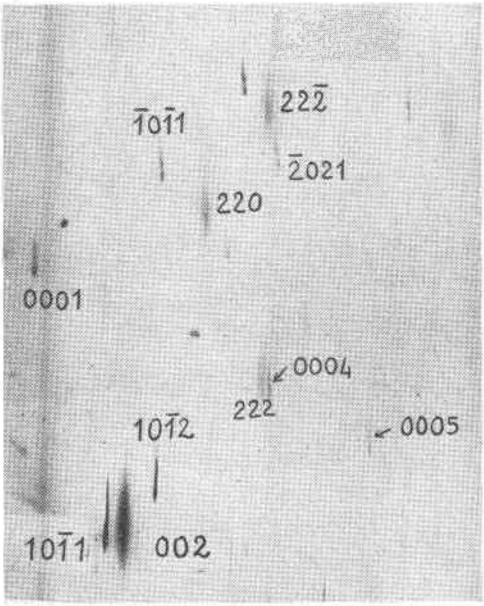

FIG. 2

When the dehydration is completed the photograph (Fig. 3) shows the reflections corresponding to the two orientations of the MgO. If we study these diagrams we may see that the reflections corresponding to orientation I are more intense than those corresponding to orientation II. There is a greater proportion of crystals that adopt orientation I.

By means of a photometric study of the reflections, the proportion of each orientation can be determined. This proportion varies between the limits of 75–80% for orientation I and 25–20% for orientation II. The diagrams obtained with crystals dehydrated progressively permit one to study the development of the crystals with the two orientations. When the amount of water given off reaches 20%, we begin to get the reflection 200 corresponding to orientation I; we can not observe the orientation II until the amount of water given off is higher than 50%. Figure 4 shows the nature of the results obtained when the crystals are dehydrated at

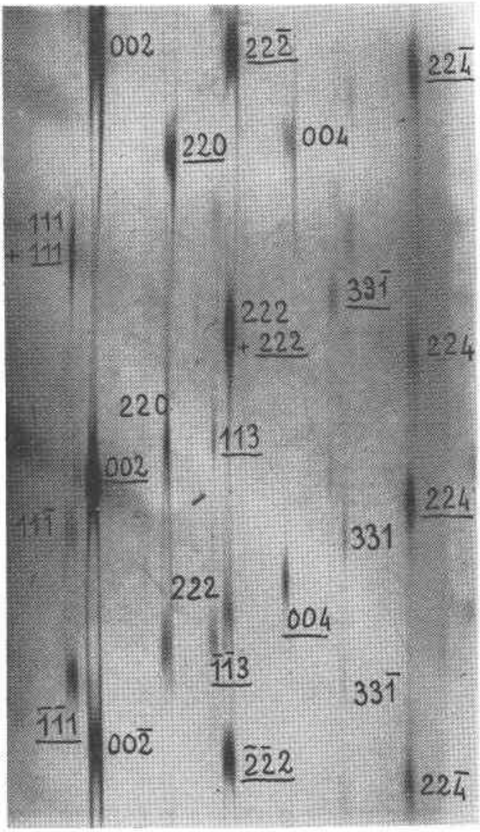

FIG. 3

500° C. At 700° C the development of the two orientations progress in an analogous manner. At higher temperatures, however, we obtain a greater proportion of orientation I. A test carried out at 2,000° by means of an induction-furnace has given a diagram in which only the reflections

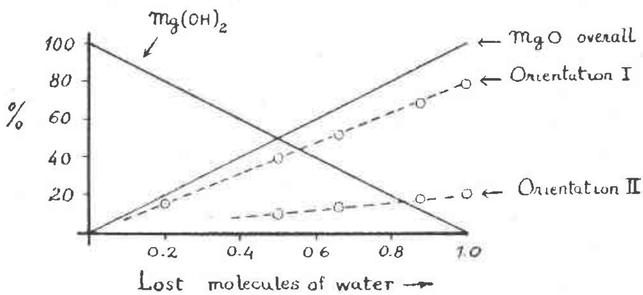

FIG. 4

corresponding to orientation I can be observed; the reflections are then more sharp, probably because the crystals are larger due to recrystallization. The dominance of orientation I is undoubtedly due to the fact that in nuclei having this orientation the Mg—O bonds have the same orientation that they had in the hydroxide, while in the crystals of the second orientation the Mg—O bonds are along directions different from those the bonds had in the brucite (Fig. 5).

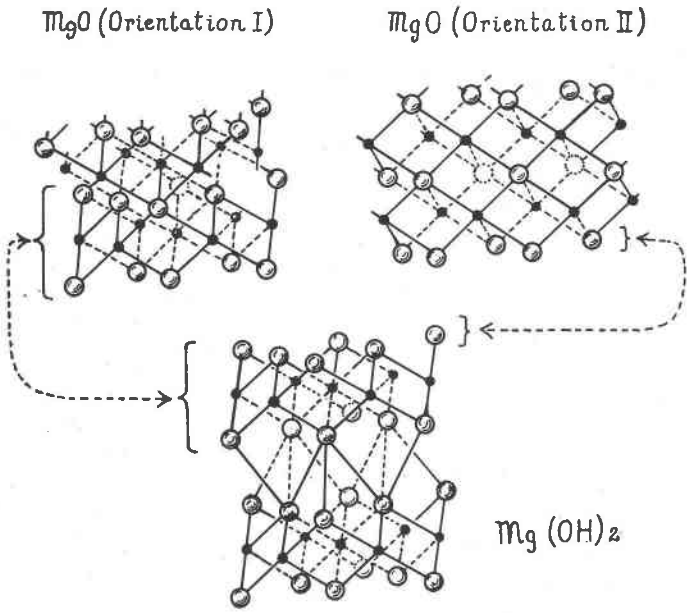

Fig. 5

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NOTE ON THE OCCURRENCE OF CORUNDUM IN IDAHO*

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During the field season of 1950 a corundum occurrence in sec. 22, T. 11 N., R. 4 E., of Valley County, 5 miles east of Smiths Ferry, was brought to the attention of the writer by Mr. Wayne Bowman, of Garden

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