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Note on the stiffening of gypsum plaster

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The different details of stiffening gypsum plaster are not yet entirely explained. The stiffening process of gypsum takes place on the way of recrystallisation from calcium-sulphate semihydrate into calcium-sulphate dihydrate. Several authors are of the opinion that there is a gelatinous state during the first stiffening phase [1, 2, 3]. This gelatinous state could not be confirmed in a recent publication examining this process by means of the Debye-Scherrer-methode [4, 5]. In an other investigation using microscopic methods the typical needlelike crystals of the dihydrate could not be observed; but such crystals were found as are seen when pure metals are crystalized [6].

The examination of the stiffening with the help of the nuclear magnetic resonance presents some difficulties. In the first place the signal of the solid state is very weak and in the second the usual gypsum—water—mixtures have a great abundance of water disturbing the measuring. Theoretically the stoichiometrical proportion of water to gypsum of 0.186 is sufficient to transform entirely the semihydrate into dihydrate. But the usually used proportions extend from 0.6 to 0.8. Before the abundance of water in such a mixture is evaporated the semihydrate is completely transformed into dihydrate. This fact is confirmed by the NMR-measurements. The curves show that the crystallisation must have begun at the first moment. Only a few days after that the free water disappeared while the component of solid state hardly increased. The evaporating process depended of course on temperature. The signal being weak, a great modulation amplitude had to be used. Therefore the component of water in the curves is very broadened. Nevertheless the increasing of the component of the solid state is easily to be seen. In order to get more exact results the experiment was changed in the following way. During the measurement only one drop of distilled water was added to the dried semihydrate sample and the stiffening process

immediately observed. It is probably that there is no abundance in water when using this method. The water is entirely exhausted by the crystallisation. It is true the crystalized part of the sample is small that is to say the filling factor of the sample coil is small with respect to the crystalized portion. The dropping method giving an inhomogenous sample, and the disturbance in middle of the curves render exact quantitative calculations difficult. Yet the following qualitative results may be given:

1. The crystallisation begins instantly after adding water and finishes after an hour for the most part.
2. The structure of the component of the solid state being equal during the whole stiffening process, any gelatinous state is not to be supposed.

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