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Structural Interpretation of Orientated Overgrowths in Crystallization

MINERALS belonging to quite different species, for example, rutile and mica, often show definite geometrical associations. Experimental overgrowths of salts and other chemical compounds on crystalline matter such as gypsum cleavages have been investigated by a number of authors[1]. Consideration is generally given to superposition of the two lattices at the connexion surface of the two associated crystals[2]. Agreement between the lattice plane of

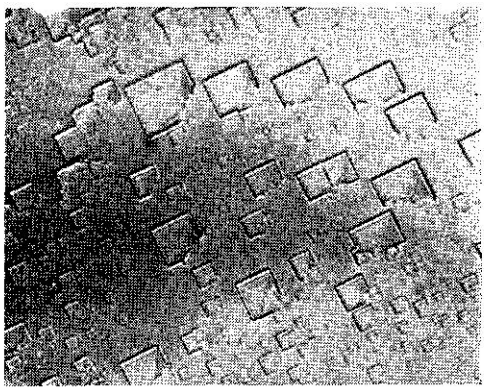

Fig. 1. Overgrowth potassium chloride/mica ((100)/(001)). (× 100.) Microphoto B. and G. Deicha

the deposit and the lattice plane of the substratum is not always satisfactory.

With structure data available for both substratum and deposit, it is possible to seek a less rigid interpretation. A new type of orientated overgrowth of alkali halides on mica will enable me to discuss this point briefly. I have already described, in recent French publications[3], the genetic conditions of this type of overgrowth; crystallographically it is characterized by parallelism and orientation of a face (100) of the cube of the halide upon a cleavage plane (001) of mica. A supersaturated potassium chloride solution crystallizing on muscovite provides perfect samples of this orientation. As shown in Fig. 1, it is possible to obtain whole areas of the mineral covered with parallel orientated crystals of the salt. The result is not altered by the position of the substratum

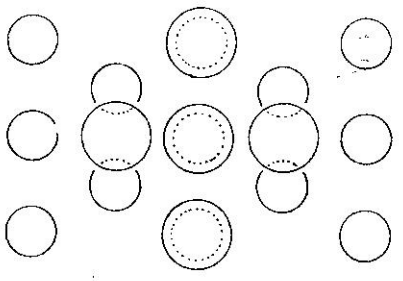

Fig. 2. A structural interpretation: K^+ ions (radius 1·33 A.), substratum. Cl^- ions (radius 1·81 A.), deposit nucleus

and is observed on upper and lower faces of the lamellæ of muscovite under the microscope. Nucleation of potassium chloride crystals seems to occur at the actual surface of the mica.

Consider the pseudohexagonal layer potassium ions on the cleavage face of muscovite. This layer offers different possibilities for the attachment of the chloride ions. Fig. 2 shows schematically the location of chloride ions, which could provide a nucleus for further crystallization of potassium chloride, with a face of the cube orientated upon the cleavage plane of the sheet of mica. In this case diagonals of the potassium chloride cubes will be parallel to the rows [100] and [010] of muscovite.

Such interpretations suggest some alterations in the structures of the overgrowth. Such alterations can be traced and distortions are common in overgrown crystals. This is to be the subject of future studies in connexion with alterations of structures and distortions in twinning[4].

G. A. Deicha

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