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Atomistic Mechanisms of Habit Modification of Alkali Halide Crystals. 3. Effects of CH_3OH, $HgCl_2$, $O=CHNH_2$ and $K_4Fe[CN]_6$

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Summary

Atomistic mechanism of habit modification, with additives or by the choices of solvents, of NaCl crystal was studied by observing facet formation processes with atomic force microscopy(AFM) in solutions. Methanol stabilizes (113) surface just like ethanol, which suggests that the O atom of alcohol adsorbs on (111) ledge formed by Na ions and that the hydrophobic interactions between the alkyl groups of alcohol are not very important for the stabilization of the surface. On the other hand, the smaller size of methanol enables stabilization of (110) surface, which does not occur with ethanol.

$HgCl_2$/ethanol stabilizes NaCl(110) surface giving atom-resolved AFM images of c(2x2) adsorption structure. Most probably, the electrostatic repulsion between $HgCl_4^{2-}$ ions causes the structure.

At NaCl(100) surface, on the other hand, very shallow square etch pits having each a screw dislocation at the bottom were formed in the same solution. The square bases and the monatomic steps forming square spiral runs in <110> directions. The (100) surface and (111) ledges on it are also stabilized by the $HgCl_4^{2-}$ ions. The adsorption structure should be different with that at the (110) surface.

Formamide added to saturated aqueous solution of NaCl stabilized (111) surface, which probably was caused by adsorption of the carbonyl O atom on Na ions. This molecule did not stabilize any other face.

Ferrocyanide ion is a famous anti-caking agent. Addition of the potassium salt to aquous ethanol stabilized (120) and (100) facets. Stabilization of these faces explains well the dendrite growth of NaCl in the presence of the agent.

Friction measurements with frictional force microscopy(FFM) at (110) and (111) Surfaces stabilized by above methods gave reasonable anisotropy just as expected from the periodicities of the surfaces.