

Physico-Chemical Properties of Alkali Halide Surfaces

H. Shindo<sup>a</sup>, M. Kwak<sup>b</sup>, T. Hiyama<sup>b</sup>, Y. Kitamura<sup>b</sup> and D. Arai<sup>b</sup>

The Institute of Science & Engineering<sup>a</sup>

Graduate School of Science & Engineering<sup>b</sup>

Chuo University, Tokyo, Japan

Summary

1. Effect of potassium ferrocyanide upon step mobility at NaCl(001) surface

Monatomic step motion at NaCl(001) was studied with AFM in the presence of potassium ferrocyanide crystal, an anti-caking agent. In the absence of the crystal, step motion is observed at relative humidity (RH) over 47%. In the presence of the anti-caking agent, however, at the distance of 0.1mm, the step motion was recognized only at RH>70%. At the distance of 3mm, the step motion was recognized at RH=55%. The agent is most probably working molecularly depending upon the concentration. A specific interaction is recognized for ferrocyanide ion with <100> steps.

2. Growth of alkali halide whiskers from porous membrane

When saturated aqueous solutions of alkali halides were kept in cellophane bags, various whisker crystals grew out within hours. By observing tubular whiskers of NaCl with optical and electron microscopes, we elucidated the mechanism of the whisker growth. Tubular whiskers are mostly flat-faced on the side, showing the nature of single crystals. The salt is transported through a central duct, not on outer surfaces. Some mechanism works in keeping the tube width constant. When salt transportation was disturbed by air bubbles in the duct, however, the tube is constricted. The directions of growth steps at the top face are in contradiction with spiral growth. Dendritic growth were observed with NaBr and KI whiskers.

3. Surface markings on cleaved surfaces of alkali halide crystals

Step structures on cleaved surfaces of various alkali halide crystals were observed with atomic force and optical(Nomarski differential contrast) microscopies. Only macro steps, higher than 6.7nm were visible with the optical microscopy. Detailed step structures, invisible with transmission microscopy with Au decoration, were observed with AFM. Various surface markings were detected along the paths of the cleavage front. Very high (200-500nm) cleavage steps in random orientations are observed in the beginning. Later, the cleavage steps becomes much lower (5-15nm) and run closer to the direction of a crystal axis. Monatomic steps are also visible.