

## Adsorption Dynamics of Trisodium Citrate Dihydrate on NaCl Surface

°Voni Fulitasari<sup>1</sup>, Yuki Araki<sup>1</sup>, Toyoko Arai<sup>1</sup>

Kanazawa Univ.<sup>1</sup>

E-mail: voni.fulitasari@stu.kanazawa-u.ac.jp

Additives are important for controlling crystal growth and their morphological changes. Such additive's effect is essential for various applications. In this study, we conducted in situ observations of the adsorption behavior of trisodium citrate dihydrate ( $C_6H_5Na_3O_7 \cdot 2H_2O$ ) on NaCl crystal surfaces using frequency modulation atomic force microscopy (FM-AFM) toward understanding the mechanism of morphology changed induced by additives.

A cleaved NaCl (100) surface was dripped with 2  $\mu$ L of pure water or trisodium citrate dihydrate solutions (0.01–0.04 M in pure water) under dry conditions (relative humidity (RH) < 40%), and changes in surface morphology were observed. On the pure water-treated surface, flat terraces with smooth steps were observed (Fig.1a). In contrast, in the presence of additives, the step morphology appeared roughened, and also clusters were observed along the step edges and on parts of the terraces (Fig.1b), indicating the adsorption of the additive onto the surface. Next, NaCl crystals were immersed in a saturated NaCl solution containing 0.1 M trisodium citrate dihydrate for 1–3 days. After immersion, the surface was immediately rinsed with ethanol and then dried by heating at 100 °C for 30 minutes. Observation under dry air conditions revealed multiple holes along the step edges, which expanded with immersion time (Fig.2). These holes were not observed in additive-free conditions, confirming that the effect was due to the presence of the additive. In the presentation, we will discuss the adsorption dynamics of trisodium citrate dihydrate on the step morphology and its temporal changes with and without the additive.

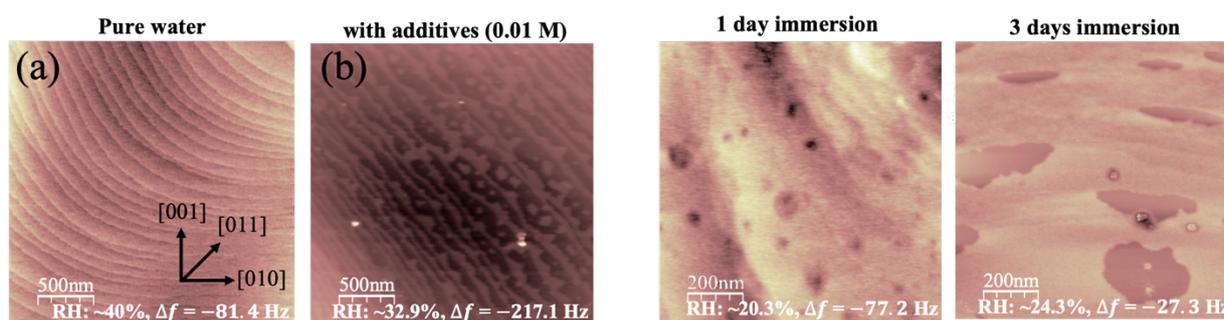


Fig. 1. FM-AFM images taken in air of NaCl (a) dripped with pure water and (b) with additives (0.01 M).

Fig. 2. FM-AFM images taken in air of NaCl (a) immersed in saturated NaCl solution with additive (0.1 M) for 1 day and 3 days.