Atomic Scale Growth and Microscopic Investigation of ionic Insulating Layer on Ag(111) and its Interaction with Molecules

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With the increasing importance of nanoscale surface insulators in studying the intrinsic properties of atoms and molecules, ionic layers are most promising due to their high bandgap and low reactivity, which decouple interactions from the metal surfaces. NaCl layers have already gotten much attention in that respect, e.g., for imaging individual molecular orbitals of adsorbed molecules, their self-assembly, isomerization, and their functionalities. Recently, "on-surface reaction" techniques have been widely used in scanning tunneling microscopy (STM), where insulating layers play an essential role in the synthesis of functional materials. NaCl is the most studied due to its stoichiometric growth into atomic layer islands. Most studies revealed that the NaCl islands grow in the form of a bilayer instead of a monolayer when deposited at room temperature to compensate for the ionic charge of the first layer. Here, we demonstrate a novel approach to understanding the growth mechanism of an ionic layer by releasing molecules for further nucleation from an existing layer.

In order to study complex yet fundamental chemical processes such as organic reactions or solvation, a low interacting environment is required. Our central strategy is to utilize insulating layers on metal surfaces as a low-interaction interface to get unperturbed and real-space insight into these processes by STM.