

Observation of adsorption mechanism of purine on Ge(100) by STM

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Adsorption mechanism of purine on the Ge(100) surface was studied by scanning tunneling microscopy (STM) and theoretical calculation. Purine is one of the aromatic molecule, containing four N-atom being good electron donors. In the room temperature STM images, three types of bright protrusions attributed to the purine molecules are observed. We labeled those protrusions as features A, B and C. The number of feature C is increased when we annealed the sample at 320 K and 360 K. When we annealed the Ge sample with adsorbed purine molecules at 400 K for an hour, a new adsorption structure similar to the feature C was found and the relative population of that structure is more than 90 %. Based on the results of the isotope exchange in heterocyclic cations experiments⁽¹⁾ and our theoretical calculation, we reveal that the different types of features observed in the STM images means different transition states of purine molecule. It is found that the adsorption reaction mechanism of purine with mutiple functional groups on Ge(100) undergoes a reaction similar to proton exchange. Additionally, in this adsorption reaction, the surface dangling bond act as a H₂O in aqueous solution.

[Reference]

1. Donald W. Boerth, Francis X. Harding, "Theoretical Investigation of Acidity and Isotope Exchange in Purine Nucleotide Cations" J. Am. Chem. Soc. 107, 2952 (1985).