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Adsorption of Benzoic acid on the Ge(100) Surface

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The adsorption of benzoic acid (BZA) molecule onto the Ge(100) surface was investigated using scanning tunneling microscopy (STM) at RT. The adsorbates show oval shaped-bright spots which are three different types of adsorption structures marked A, B, C in Fig. 1. We measured the voltage dependent STM images to investigate the detailed geometry. In case of A and B feature, a single BZA molecule bridges either side of two adjacent dimer within the same dimer row. This end-bridge configuration induces the buckling of the neighboring Ge dimers. Feature B is similar to the image of the feature A except the change of buckling of neighboring Ge dimer. The adsorption of C configuration shows bright protrusion independent on bias voltage, has the symmetric neighboring dimers and forms on-top five-membered ring structure. It suggests that BZA molecule binds to a Ge-Ge dimer via Ge-O linkage through the dissociation of O-H bond on Ge(100) and the carboxyl oxygen atom reacted with up-Ge atom of the same dimer. By annealing, feature A and B are converted into feature C which is the most stable adsorption structure.

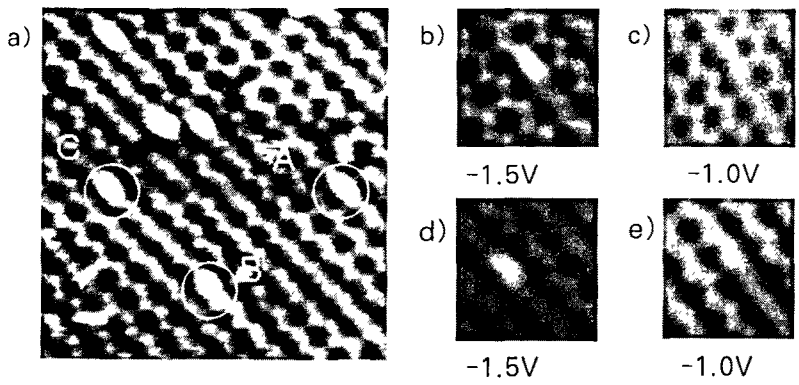

Fig 1(a) The filled state STM image (12 x 12 nm^2, V_s=-2.0 V , I_t = 0.1nA) of BZA adsorbed on Ge(100) surface shows three different configurations marked A, B and C. Magnified topographies of products. (b)-(c) feature A, (d)-(e) filled state topographies for the feature B.