

Study of Isolated Fullerene Molecule

Realized By a Glycine/Cu(111) Nanocavity Template

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Study of fullerene-based functional devices has been attracting increasing attentions due to their promising characteristics ranging from electronic and optical properties such as rectification and photoelectric conversion to mechanical characters. Realization of isolated fullerenes adsorbed on metal substrates with their original properties is one of the important challenges for fabrication of single molecular fullerene-based devices. There are difficulties, however, because of their high mobility on metal surfaces at low coverage and strong intermolecular interactive interaction. Recently, we have developed a supramolecular structure featuring a well-ordered 2D porous network by glycine/Cu(111). Here we report that the stable study of isolated fullerene has been enabled by using the glycine supramolecular network with a nanocavity array (~1.3 nm diameter) as a template.

A Cu(111) surface was cleaned by repeated sputter-anneal (820K) cycles with Ar⁺ in ultra high vacuum. Glycine molecules were evaporated from an Al₂O₃ crucible (350K) on the Cu(111) substrate which was kept at room temperature. Sublimation of the fullerene molecules was performed by heating the C₆₀ doser at 400 °C. STM/STS measurements were performed at 5K using the constant current mode.

Figure (a) shows a typical STM image of C₆₀ molecules adsorbed on a glycine/Cu surface with a small coverage (< 0.2 ML) observed at 5 K. Fig. (b) is the corresponding *dI/dV* image of Fig. (a). C₆₀ molecules stably adsorbed in the glycine nanocavities as well as the areas surrounded by molecular boundaries. This suggests that a barrier against diffusion was formed and enhanced by glycine molecules. Apparently, the C₆₀ molecules have two different states, that is, dark and bright states. As shown in the *dI/dV* image (Fig. (b)), they have a round and a 3-fold symmetry, respectively. And, we also studied the electronic properties of the adsorbed C₆₀ by *dI/dV* measurement (Fig. (c)). The characteristic of the result is very similar to that of the previous result reported for C₆₀/Cu(111) by C. Silien *et al*, indicating that the glycine molecules surrounding C₆₀ molecules do not affect them and leave almost their original properties.

Details will be discussed at the conference.

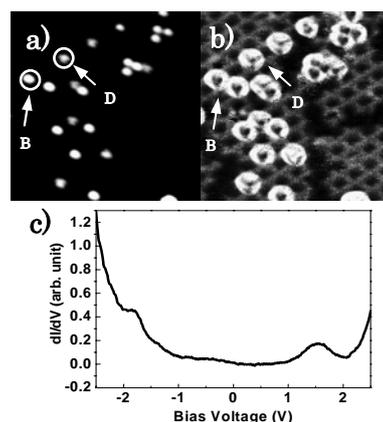


Fig. a) A STM image of C₆₀, b) the corresponding *dI/dV* image showing the distinct symmetries for the two different adsorption states, and c) the *dI/dV* curve for C₆₀ on the glycine network.