Charge transfer and metal deposition at ordered fullerene layers

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Ordered layers of C60 are shown to undergo a cluster formation by electrochemical reduction in contact with aqueous solutions. These films were prepared by vacuum vapour deposition of C60 on highly oriented pyrolytic graphite (HOPG) and Au(111) surfaces. In the close-packed fcc structure with the periodicity of about 1 nm the formation of clusters can occur in the electroreduction in aqueous KOH solutions in a single irreversible electron transfer at -1.5 V/SCE. The formation of clusters and the parameters which influence the their type and distribution is studied by different methods like in situ Raman spectroelectrochemistry, in situ IR spectroelectrochemistry, scanning probe microscopy (SPM) and cyclic voltammetry. It is shown by vibrational spectroscopy which superstructures of the fullerene molecules are formed in the closed ordered film. Especially the existence of highly ordered C60 cluster films at the electrode are studied. Furthermore such fullerene cluster films are used as a matrix for metal electrodeposition which is studied by cyclic voltammetry and tunnelling microscopy. The distribution of the metal layer, the occurrence and distributions of metal clusters and the homogenity of clusters is described for copper and discussed with respect to the stability of the fullerene matrix. The application of this metal/fullerene layer as a new material for future application is presented in the summary of the contribution.

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