

Step Decoration with Pd at Au Single Crystal Electrodes  
— impact on adsorption and catalysis  
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Surfaces of regularly stepped single crystals can be decorated with foreign metals in order to change their physicochemical properties [1-3].

Step decoration of vicinally stepped platinum single crystals was achieved for many metals and can be easily monitored in cyclic voltammetry due to the suppression of the corresponding hydrogen adsorption at step sites. By using the system Au(hkl)/Pd reactive bonding sites shall be introduced at regular spacings. Here step decoration is more difficult to prove. Au(111), Au(332) and Au(331) were used as the substrate for palladium deposition in the UPD-regime. Preparation and Pd deposition were checked by STM.

Cyclic voltammetry shows two Pd-oxidation peaks, the first one being almost independent of coverage; it is therefore ascribed to Pd decorating steps. Hydrogen adsorption on the modified stepped surfaces, but not on Au(111)/Pd, takes place only when more than a critical amount of Pd has been deposited. A voltammetric peaks at ca. 0.3 V vs. RHE is related to the adsorption of hydrogen at palladium terraces, at this potential the adsorption of hydrogen on steps is negligible. A quantitative evaluation supports the assumption of step decoration by Pd. Electrochemical Impedance Spectroscopy (EIS) was used to distinguish hydrogen adsorption on the Pd thin films from the double layer capacity and to identify hydrogen adsorption at Pd decorating steps. Using differential electrochemical mass spectrometry (DEMS), benzene adsorbing at step sites was distinguished from that adsorbing at terraces.

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