

E2-03: Adsorption of organic molecules on platinum electrodes

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Bare platinum electrodes in aqueous solution show complicated electrochemistry and the formation of surface platinum oxide and subsequent reduction are not yet completely understood. However, the effect of organic substrates on the oxidation/reduction and the hydrogen adsorption/desorption region is very interesting.

Cyclic voltammetric experiments indicate that methanol shows the greatest adsorption among the other saturated aliphatic alcohols studied. The decrease in the current of the hydrogen adsorption peaks, with sequential additions of methanol, predicts that the platinum electrode surface is covered with methanol molecules. This adsorbed layer of methanol is probably desorbed during the reverse potential scan to allow the direct oxidation of methanol. The oxidation peak appears at about +0.25 V vs. SCE at 200 mV/sec and the peak current shows a quantitative relationship with the bulk concentration.

In a separate study, the effect of several phenols on platinum surface chemistry in aqueous medium was studied, using cyclic voltammetry. The sequential additions of phenol and cresols showed that such compounds exhibit unique electrochemical properties compared to other organic molecules. The potential at which surface platinum oxide was reduced, gave a negative potential shift of about 0.3 V at 200

mV/sec, indicating the change in the surface chemistry of the platinum electrode. This shift complicates the hydrogen adsorption/desorption region of the platinum electrode.