

Electrosorption and Electrooxidation of CO on Ru(0001)

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coadsorbed CO and O on Ru(0001) electrode surface. Up to 0.55 V the CO oxidation rate increases markedly with the increasing potential in good agreement with our previous in-situ IR results. The driving force for the CO electrochemical reaction is attributed to the decrease of the activation barrier for CO oxidation by the polarization potential.

The cyclic current-potential curve for a well-defined Ru(0001) surface in 0.1 M HClO₄ solution exhibits clearly hydrogen and O/OH adsorption peaks at - 0.15 and 0.25 V, respectively. The coulometric charge of the current peak at - 0.15 V equals 120 μC/cm² corresponding to ½ monolayer (ML) H coverage. Both voltammetric peaks disappear completely by the CO electrosorption at 0 V, demonstrating that the electrosorbed CO completely blocks H adsorption. The disappeared H adsorption current peak due to the electrosorbed CO corresponds to the CO saturated coverage of 0.5 ML on Ru(0001) in good agreement with the coulometric data determined by the current transient of CO electrooxidation. The coverage of the electrosorbed CO also agrees well with the data obtained for the coadsorption system CO+O/Ru(0001) under UHV conditions. At 0.4 V no CO electrosorption takes place on a (1x1)-O/Ru(0001) surface in a CO-saturated HClO₄ solution similarly as with CO adsorption on a (1x1)-O/Ru(0001) under UHV conditions. On the other hand, the coadsorption of CO_{ad} with O_{ad} at 0 V gives rise to a well-ordered (2x2)-(O+2CO) structure similar to that observed from the coadsorption of CO and O on Ru(0001) under UHV conditions. No CO electrooxidation occurs at 0.45 V for the