

Enhancement and Deactivation of the Electrocatalytic Activities of Au Electrodes

Gorachand Dutta, Haesik Yang*

Department of Chemistry, Pusan National University, Busan 609-735, Korea
hyang@pusan.ac.kr

Much effort has been devoted to achieving high activities via morphology or composition control and/or via thermal, cathodic, or chemical treatment. Nevertheless, the dependence of electrocatalytic activities on aging has never been investigated. If electrocatalytic activities of nanomaterials or bulk electrodes change with aging, the activities measured just after their preparation or pretreatment does not represent normal ones. The electrocatalytic activities of Au electrodes are enhanced by NaBH_4 treatment (dipping electrodes in NaBH_4 solution), mechanical polishing or by piranha treatment. However, the enhanced activities slowly decrease with aging. Moreover, Au nanoparticles freshly prepared also show high electrocatalytic activities, but the activities slowly decrease with aging both in air and in solution. This deactivation becomes faster by treatment with Fenton's reagent on gold electrode. Considering all results, structurally metastable and highly electrocatalytic surface states of Au electrodes might be generated during its pretreatments or synthesis and converted into less electrocatalytic surface states via slow structural reorganization of Au.

References

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