Investigation of Enhanced CO_2 Reduction Activity in Association with the Electronic Surface State: Microscopic Physical Morphology and Chemical Structure Analyses

김해리[1], 전효상[1,2], Eduardus Budi Nursanto[1,2], 지신천[1], Jitendra Pal Singh[1], 채근화[1], 황윤정[1,2], 민병권[1,2,†]

[1]KIST; [2]UST

(bkmin@kist.re.kr[†])

There has been enormous recent interests in developing sustainable device, both reduce energy consumption and minimize pollution, due to increasing attention about environment issues. An efficient and stable electrochemical CO_2 reduction catalyst has become a key technological target in chemical synthesis and processing. Nanostructure formation is a popular strategy for catalyst applications because it can generate new surfaces that can significantly improve catalytic activity and durability. However, the increase in the surface area via nanostructuring does not fully explain the substantial improvement in the catalytic properties. We show that the short Au-Au bond length and the low work function observed in the nanostructured Au surface are related to the catalytic activity of CO_2 reduction. In addition, our results may improve the understanding of the enhanced stability of the nanostructured gold electrode based on the resistance of cation adhesion during the CO_2 electro-reduction reaction.