

Nanoarchitectures Cu₂S Functions as Effective Surface-Enhanced Raman Scattering Substrates for Molecular Detection Application

Authors : Yu-Kuei Hsu, Ying-Chu Chen, Yan-Gu Lin

Abstract : The hierarchical Cu₂S nano structural film is successfully fabricated via an electroplated ZnO nanorod array as a template and subsequently chemical solution process for the growth of Cu₂S in the application of surface-enhanced Raman scattering (SERS) detection. The as-grown Cu₂S nano structures were thermally treated at temperature of 150-300 °C under nitrogen atmosphere to improve the crystal quality and unexpectedly induce the Cu nano particles on surface of Cu₂S. The structure and composition of thermally treated Cu₂S nano structures were carefully analyzed by SEM, XRD, XPS, and XAS. Using 4-aminothiophenol (4-ATP) as probing molecules, the SERS experiments showed that the thermally treated Cu₂S nano structures exhibit excellent detecting performance, which could be used as active and cost-effective SERS substrate for ultra sensitive detecting. Additionally, this novel hierarchical SERS substrates show good reproducibility and a linear dependence between analyte concentrations and intensities, revealing the advantage of this method for easily scale-up production.

Keywords : cuprous sulfide, copper, nanostructures, surface-enhanced raman scattering

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