## Controlled Growth of Au Hierarchically Ordered Crystals Architectures for Electrochemical Detection of Traces of Molecules

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Abstract : Nowadays, noble metallic nanostructures with unique morphology are widely used as new sensors due to their fascinating optical, electronic and catalytic properties. Among various shapes, dendritic nanostructures have attracted much attention because of their large surface-to-volume ratio, high sensitivity and special texture with sharp tips and nanoscale junctions. Several methods have been developed to fabricate those specific structures such as electrodeposition, photochemical way, seed-mediated growth or wet chemical method. The present study deals with a novel approach for a controlled growth pattern-directed organisation of Au flower-like crystals (NFs) deposited onto stainless steel plates to achieve large-scale functional surfaces. This technique consists in the deposition of a soft nanoporous template on which Au NFs are grown by electroplating and seed-mediated method. Size, morphology, and interstructure distance have been controlled by a site selective nucleation process. Dendritic Au nanostructures have appeared as excellent Raman-active candidates due to the presence of very sharp tips of multi-branched Au nanoparticles that leads to a large local field enhancement and a good SERS sensitivity. In addition, these structures have also been used as electrochemical sensors to detect traces of molecules present in a solution. A correlation of the number of active sites on the surface and the current charge by both colorimetric method and cyclic voltammetry of gold structures have allowed a calibration of the system. This device represents a first step for the fabrication of MEMs platform that could ultimately be integrated into a lab-on-chip system. It also opens pathways to several technologically large-scale nanomaterials fabrication such as hierarchically ordered crystal architectures for sensor applications.

Keywords : dendritic, electroplating, gold, template

Conference Title : ICAMN 2017 : International Conference on Advanced Materials and Nanotechnology

Conference Location : Bangkok, Thailand

Conference Dates : December 18-19, 2017

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ISNI:000000091950263