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Controlled growth of Au hierarchically ordered crystals architectures for electrochemical detection of traces of molecules

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Nowadays, noble metallic nanostructures with unique morphology are widely used as new sensors due to their fascinating 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, 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. 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 in a lab-on-chip system.

Biography

Pierre Bauer has completed his Engineer Diploma and a Master in Polymer and Advanced Technologies, he will defend his PhD at end of January 2018 at Université de Haute Alsace in Mulhouse (France). This PhD topic is based on a collaborative project entitled NanoTRAACES supervised by the Centre National d'Etudes Spatiales (CNES). It focuses on the development of a new regenerative sensor for the detection of specific molecules. At present, one paper has been published and two other papers are being finalized with two additional patents deposited by CNES.

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