Block-Copolymer Templated Gold Nanostructures for Molecular Sensing through SERS Spectroscopy

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Self-assembled nanostructures from amphiphilic block copolymers have received interests in nanoscience and nanotechnology. Incorporating metals within self-assembled block-copolymer nanodomains as a template could form versatile and robust nanostructures with a broad range of applications, including surface-enhanced Raman scattering (SERS) enhancement. SERS is an important tool for the analytical, trace detection of many inorganic and organic materials. Self-assembly can avoid aggregation of gold nanostructures which could decrease its performance in some way. Hence, in this study, self-assembly of BCP was used to form nanoporous networks through surface reconstruction of micellar films of multilayer thickness (SR-PS-*b*-P2VP). UV irradiation in nitrogen (UVIN) was used to stabilize the template and to reduce the gold ions to form gold seeds (GS-PS-*b*-P2VP). Gold nanostructure (GN-PS-*b*-P2VP) with protruding tips were further formed through the growth approach by immersion in a precursor solution. As a result, seed-growth method allows the formation of gold interconnected frameworks with distinct substructures through BCP templating. The resulting enhancement factor of gold substrates using R6G dye as the model molecule are ~10^8 and ~10^6 folds for 10 μM and 1 μM R6G, respectively. Such results prove the excellent performance of gold nanostructure fabricated from a relatively simple method for high potential in SERS-related applications.

References:

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