Title

Chemical assembly of modified Au nanoparticle clusters on diblock copolymer templates for SERS enhancement

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Chemical assembly of modified Au nanoparticle clusters on diblock copolymer templates for SERS enhancement

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Abstract

Using chemical self-assembly techniques, we attached monodisperse, colloidal gold nanoparticles on self-organized polymer templates, patterning arrays of nanoparticle clusters with sub-10 nanometer interparticle spacing to engineer enhanced optical fields. Poly(methyl methacrylate) domains in phase-separated polystyrene-b-poly(methyl methacrylate) diblock copolymer thin films were chemically modified with surface amine chemical groups for controlled arrangements. Chemically synthesized gold nanoparticles, from 10 and 20 nanometer diameter sample sets, were attached to the amine-functionalized surfaces using EDC crosslinking chemistry with thioctic acid ligand-bound to the nanoparticle surface, preferentially immobilizing the Au nanoparticles on PMMA domains of the copolymer template. By controlling particle size relative to PMMA domain size, nanoparticle clustering was controlled. SERS measurement of the planar nanoparticle assemblies showed uniform signal enhancement across each samples with 107 maximum signal intensity enhancement factor and reusability of SERS substrates with simple analyte removal between application.