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Gold nanoparticle self-assembly and gold patterning using thin film polymer blend templates. RANJAN D. DESHMUKH, RUSSELL J. COMPOSTO, Materials Science and Engineering, University of Pennsylvania — In this study we have used thin films of polymer blend of Poly(methyl methacrylate), PMMA, and Poly(styrene-ran-acrylonitrile), SAN, as templates for patterning gold as well as gold nanoparticles on silicon substrate. PMMA/SAN phase separate above lower critical solution temperature, LCST, and form cylindrical and bi-continuous morphologies in 50/50 and 70/30 blend compositions. Selectively etching out PMMA phase by UV and acetic acid treatment results in a template, which is used for patterning. Gold is sputtered on these templates followed by removal of SAN in a solvent, leaving gold patterns on the substrate. Unique cylindrical island-like and bi-continuous patterns were observed by AFM. We also selectively patterned the etched region (PMMA) with a self-assembled monolayer, SAM, of 3-aminopropyl-triethoxysilane, APTES, followed by SAN removal and coating the exposed region with 3-mercaptopropyl-trimethoxysilane, MPTMS. Further, deposition of colloidal citrate-stabilized gold nanoparticles resulted in the selective deposition of gold nanoparticles on APTES (island-like and bi-continuous patterns), because of the charge-charge interactions between nanoparticles and SAM.

Ranjan D. Deshmukh
Materials Science and Engineering, University of Pennsylvania

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