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Fabrication of Gold Disc Arrays on ITO glass: an Inverted Pattern Generated from Plasma Etching of Nanosphere Lithographic Mask

We report a method to fabricate gold disc array pattern on indium tin oxide (ITO) glass by incorporation of nanosphere lithography and plasma etching technique. In the process, hexagonal close-packed polystyrene (PS) spheres were served as mask for blocking an interaction of oxygen plasma and indium tin oxide surface. Topographic images and C-AFM current mappings demonstrated different thicknesses and conductivities of plasma etched ITO surface, particularly in gap area between PS spheres and area under PS spheres. We found that exposed ITO surface exhibit significantly higher resistivity compare with the area protected by PS spheres. As a result, site-selective electrodeposition of gold was produced on patterned ITO glass. The microdiscs diameter and distance between microdiscs can be controlled by plasma etching condition. The gold disc diameter decreased linearly with an increase of plasma etching time in range of 1-8 min and no change was observed with longer etching time up to 20 min. The formation of this structure also depends on plasma etching power. Size and density of gold particles increased with electrodeposition charge. Finally, this novel fabrication suggests a simple and low-cost technique for design and development of specific structure of metal disc array towards electrochemical and optical sensing applications.

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