

## Nanoscale Patterning for Energy Conversion and Storage Applications

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Nano- and micro-scale patterning of polymer thin films is essential to their use as templates or masks for the fabrication of secondary nano- and micro-structured materials. In particular, these patterning techniques can be extended to energy conversion and storage applications, including organic polymer solar cells and lithium-ion batteries.

Herein, we describe that poly(styrene-*b*-2-vinylpyridine) (PS-*b*-P2VP) block copolymer templates were used to make arrays of metal nanoparticles (e.g., Au, Cu, Au-Cu alloy). We found that bimetallic nanostructures as well as pure metal nanoparticles induced the surface plasmon resonance effect in the optoelectronic devices. Increased light absorption of the polymer thin layer with the incorporation of metallic nanostructures was demonstrated, resulting in higher efficiency compared to conventional optoelectronic devices. Moreover, metal patterned arrays were used as catalyst to etch silicon materials via metal-assisted chemical etching (MACE) process. Silicon nanostructured materials have been widely used as lithium-ion battery electrodes, due to its effective cost, abundance and high storage capacity.