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A Novel Fabrication Method of Large Area Periodic Nanostructures

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Fabrication of the materials with nanometer-scale periodic array is of utmost importance due to their potential technological applications in high-density magnetic memories, single-electron devices, and optical media. Recent advances in various lithographic techniques, such as ion- and electron-beam lithography, x-ray lithography, and others seem to provide routine access to nanostructures of the sub-100 nm size scale. However, these techniques have some fundamental disadvantages: they are not cost-effective, requiring state-of-the-art facilities and time-consuming processes to generate nanostructures on large scales. Herein we report a simple and completely non-lithographic route for fabricating free-standing nanostructured polymeric films with a close-packed hexagonal array of nanoembosses or nanorods using electrochemically prepared textured aluminum sheets or mesoporous AAO. We also demonstrated that the textured aluminum sheets could be used as a replication master for the fabrication of the polymer/nanoparticle composite films, whose structural features are characterized as a close-packed hexagonal array of polymeric nanoembosses containing nanoparticles.