

Large-Scale Micropatterning of Plasmonic Nanostructures using 2D Colloidal Crystals

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Metallic nanostructure smaller than wavelength can generate a monochromatic color pixel, allowing high-resolution imaging below the diffraction limit. Conventionally, E-beam lithography or FIB lithography is used to achieve a subwavelength nanostructure. However, these processes suffer from the complex, expensive procedures and limited scale of imaging. Here, we use the nanodimple arrays from 2D colloidal crystals as templates for the plasmonic coloration. Self-assembly of colloidal nanoparticles into a 2D colloidal crystal is an efficient means for creating periodic nanostructures, which does not require complex or time-consuming processes. Periodic nanodimple arrays can be fabricated by embedding 2D colloidal crystals at a negative photoresist film, followed by selectively removing colloidal arrays. The plasmonic nanostructure can be fabricated by depositing metal on the nanodimple arrays with an e-beam evaporator. Plasmonic colors can be tuned depending on the size of the colloidal nanoparticles. Furthermore, plasmonic color patterning is realized using photolithographic process combined with creep deformation of the polymer films by a thermal input.