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Controlling the plasmon response of metal nanostructures using the metal-insulator transition in vanadium dioxide

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Abstract

Vanadium dioxide has a metal-insulator (MIT) transition at 70˚C that can be triggered by heating or by hole-doping with ultrafast lasers. We have used this MIT to modulate the plasmonic response of metal nanostructures in two different geometries: metal-VO_2 bilayer films with sub-wavelength hole arrays, and gold nanoparticle arrays capped with a thin layer of VO_2. I will discuss the effects observed in these composite nanostructures, including switching of the extraordinary optical transmission effect in the metal-VO_2 bilayers, and wavelength shifts in the surface plasmon resonance in the gold nanoparticle arrays.