

## Development of Optical Metamaterial for Sensor Applications

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We conducted extensive theoretical and experimental studies for optical metamaterials based on metal nanoparticles. Metal nanoparticles support strong optical resonance and the synthesis techniques are well developed. Our theoretical modeling studies showed that we can produce metamaterials with strongly enhanced absorption in the visible frequency range by dispersing metal nanoparticles in a dielectric matrix. The position of the absorption band can be tuned by adjusting the size and shape of the metal nanoparticles and also by the proper choice of background dielectric. We then proceeded with synthesis and surface treatment of metal nanoparticles. Gold nanoparticles was synthesized with highly uniform size distribution. We then proceeded to preparation of polymer film containing gold nanoparticles. The choice of polymer was Poly(methyl methacrylate) (PMMA) because of their excellent optical properties in the visible region and also because of their well know processing techniques. We successfully prepared gold-PMMA film by spin-coating and observed the emergence of absorption band at 550 nm due to the gold nanoparticles.