Abstract

Designing of Gold Nanoprism-Based Reversible and Ultra-sensitive Molecular Sensors
Gayatri K. Joshi and Kimberly A. Smith
Department of Chemistry and Chemical Biology, Indiana University- Purdue University Indianapolis.

Photoswitchable molecules have attracted a great deal of attention over the past few years in designing molecular machines. Among photoswitchable molecules, azobenzene is widely studied due to its trans-cis photoisomeration, which produces a simple structure and spectra, and is photo and electrochemically active. The localized surface plasmon resonance (LSPR) properties of the metal nanostructures in conjunction with the photswitching properties of the azobenzene molecules allow the nanoscale environment to be more controlled and to ultimately improve the sensing abilities of the metallic nanostructures. We have developed a method of constructing a self-assembled monolayer (SAM) of azobenzene-containing alkanethiol molecules on the surface of chemically synthesized gold nanoprisms as molecular sensor. The reversible photoswiching properties of azobenzene were studied by monitoring the LSPR peak shift of gold nanoprisms by absorption spectroscopy. It was found that the substrate-bound gold nanoprisms functionalized with azobenzene alkanethiol molecules resulted in a ~30 nm LSPR peak red shift. The photoswitching behavior of the azobenzene molecules attached to the prisms was monitored after cycling exposure to UV and visible light. A ~12 nm LSPR blue shift was observed as the light exposure was switched from visible to UV light due to the trans to cis isomeration of the azobenze. The LSPR peak shift was found to be reversible as the light source was switched back and forth several times from UV to visible light. The reversible photoswitching of azobenzene-functionalized gold nanoprisms demonstrates their potential as ultra-sensitive molecular sensors for a broad range of applications from nanoelectrochemical systems to medicine.

Advisor: Rajesh Sardar, Department of Chemistry and Chemical Biology, Indiana University- Purdue University Indianapolis, Indianapolis, IN.