# Synthesis of New Liquid Crystals Embedded Gold Nanoparticles for Photoswitching Properties

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**ABSTRACT**

A new series of liquid crystals decorated gold nanoparticles is synthesized whose molecular architecture has azobenzenes moieties as the peripheral units connected to gold nanoparticles (Au NPs) via alkyl groups. The morphology and mesomorphic properties were investigated by field emission scanning electron microscope, high-resolution transmission electron microscopy, differential scanning calorimetry and polarizing optical microscopy. The thiolated ligand molecules (**3a–c**) showed enantiotropic smectic A phase, whereas gold nanoparticles (**5a–c**) exhibit nematic and smectic A phase with monotropic nature. HR-TEM measurement showed that the functionalized Au NPs are of the average size of 2 nm and they are well dispersed without any aggregation. The *trans*-form of azo compounds showed a strong band in the UV region at ~378 nm for the $\pi$-$\pi^*$ transition, and a weak band in the visible region at ~472 nm due to the n-$\pi^*$ transition. These molecules exhibit attractive photoisomerization behaviour in which *trans-cis* transition takes about 15 s whereas the*cis-trans* transition requires about 45 min for compound **5c**. The extent of reversible isomerization did not decay after 10 cycles, which proved that the photo-responsive properties of **5c** were stable and repeatable. Therefore, these materials may be suitably exploited in the field of molecular switches and the optical storage devices.

**KEYWORDS**: Liquid crystals; Gold nanoparticles; Photoswitching; Molecular switches; Optical storage

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