

Photochemical Control of Spontaneous Arrangements of Gold Nanoparticles with Azobenzene Liquid Crystals

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Recently, metal nanoparticles have been expected to be applicable to novel materials for the electronics, photonics, and magnetic devices due to their unique properties based on the quantum size effects. In terms of application, it is interest to control the spatial arrangement and distribution of the nanoparticles.¹⁻³ In the present work, the spontaneous arrangements of the gold nanoparticles were accomplished with liquid-crystalline (LC) ligands. Special attention was paid to the control of the structure of those arrangements by light.

Many photoresponsive LCs have been developed so far and controlling their molecular alignment and distribution by light has been reported.^{4,5} For example, the LC to isotropic (I) phase transition can be induced by means of the photoisomerization of the azobenzene units and the phenomenon has been called "photochemical phase transition". We considered that the spatial arrangement and distribution of the metal nanoparticles could also be controlled using the photoresponsive LC ligands. We, therefore, synthesized gold nanoparticles covered with a monolayer of the azobenzene LC ligands. The photochemical behavior, LC properties, and spontaneous arrangements of the gold nanoparticles were observed in this study. Control of the nano structures of the organization of nanoparticles by photoisomerization of the azobenzene units will also be discussed.

References

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