

SUMMARY

The D-A and π - π Interactions and Their Use in Self-Assembly

Due to their well-defined shape, size and properties gold nanoparticles represent an advantageous platform for the study of non-covalent interactions between ligands anchored to their surface both in solution and in monolayers or thin films.

The aim of this thesis was the synthesis of ligands for gold nanoparticles bearing an anchoring group at one end and a planar π -electron rich pyrene unit at the other. Six structurally variable ligands were prepared differing in the pyrene substitution pattern and the spacer between the aromatic part and the acetylated thiol function. Furthermore, a synthetic pathway leading to extended π -electron systems (both electron rich and electron poor) such as hexabenzocoronene derivatives and its fragments was explored. The key steps in the synthesis of these compounds are the cyclization reactions of alkynes leading to polycyclic intermediates and their ensuing cyclodehydrogenation (Scholl reaction). All of the prepared ligands and their intermediates were characterized by spectroscopic methods. The structure of the key hexakis(pentafluorosulfanyl-phenyl)benzene was confirmed by single crystal X-ray crystallography.

The prepared ligands bearing a pyrene unit were deacetylated and anchored to the surface of gold nanoparticles with an approximate diameter of 7 nm prepared by the method published by Slot. These hybrid systems were then studied both in solution by UV/Vis spectroscopy and in the form of monolayers formed at the water-air interface by transmission electron microscopy. One of the prepared ligands showed strong tendency towards aggregation before as well as after being attached to the gold nanoparticles.