Annexure 3

Summary

The micelles of tetronics are highly responsive to the pH and temperature variations. The origin of pH responsive behavior is attributed to the diamine functional groups of tetronic macromolecules which in turn produced pH sensitive micelles. The presence of ether oxygens in the PEO and PPO blocks along with quaternary amine functional groups at low pH drive water molecules to induce micelle hydration; hence, these micelles are much more temperature sensitive than the micelles produced at high pH. Since these micelles are used as nanoreactors for the synthesis of AuNPs, the pH and temperature responsive behaviors are precisely reflected in the synthesis of AuNPs. The NPs synthesis is facilitated at high pH where amine moieties readily reduce Au(III) to Au(0) in comparison to at low pH. At low pH, the protonation of amine moieties and hence their excessive hydration require high temperature to initiate the reduction reaction. The AuNPs thus synthesized simultaneously adsorb on the micelle surface to attain the colloidal stabilization and hence the tetronic micelles prove to be excellent nanoreactors to synthesize nanomaterials under different reaction conditions.

We report a simple interaction of amino acids with AuNPs at different pH values (5, 7, 9, and 11). Cysteine undergoes strong and thermodynamically favourable covalent bond formation with Au surface because of the presence of –SH group, independent of pH. It may allow the desorption of citrate from AuNPs leading to different extent of aggregation depending upon pH of the media. No aggregation is observed in the case of Glu-AuNPs and Arg-AuNPs because of weaker covalent interactions of $–NH_2$ group.

PLL coated AgNPs are synthesized to explore their applicability as colorimetric sensor. The physical aspects vital for an appropriate synthesis of PLL coated AgNPs, which include the use of CTAB as stabilizing agent, optimum concentration of PLL and CTAB for the reduction and stability of AgNPs, respectively are also presented. This study demonstrates a strong surface adsorption of PLL and CTAB on AgNPs, which leads the formation of AgNPs best suited for colorimetric sensing of Hg^{2+} ions.

Au and Ag NPs are also synthesized and characterized using gemini surfactants. The size of nanoparticles vary with the variation in head and tail of gemini surfactants.