Novel surface-active water-soluble block copolymers and novel nano-spheres: Tertiary amine methacrylate based block copolymers, schizophrenic block copolymers and shell cross-linked micelles

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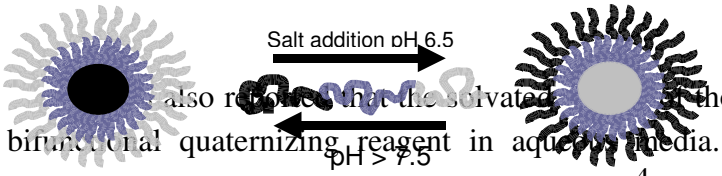
Novel surface-active water-soluble diblock copolymers were successfully synthesized *via* GTP using four tertiary amine methacylate monomers namely 2-(dimethylamino)ethyl methacrylate, 2-(N-morpholino)ethyl methacrylate, 2-(diethylamino)ethyl methacrylate and 2-(diisopropylamino)ethyl methacrylate.[1] One block of each diblock copolymer precursors was then selectively quaternized under mild conditions to yield novel water-soluble polyelectrolytes.[2] The precursors and resulting quaternized block copolymers exhibited pH-, temperature- and salt-induced micellization under various conditions.

We have also reported, for the first time, that an AB diblock copolymer can show *'schizophrenic'* behaviour in aqueous solution depending on the solution conditions.[3] That is, the copolymer chains can self-assemble in dilute aqueous solution in the absence of any organic co-solvent to form two distinct micelle structures. In each case the individual blocks can be independently tuned to become either hydrophilic or hydrophobic by subtle adjustment of the solution temperature, solution pH or ionic strength. In these days, we have just reported a novel ABC type 'schizophrenic' triblock copolymer which forms two different three-layer anion micelles, A-core micelles with –BC double-layer solvated corona and C-core micelles with –BA corona.[3]



We also reported that the solvated [illegible] those micelles can be cross-linked via a bifunctional quaternizing reagent in aqueous media. Several shell cross-linked micelles (SCL) have been synthesized and characterized:[4] (i) SCL micelles with tunable-hydrophilic core suggesting a possible "release" mechanism for these nano-capsules. (ii) Two types of novel zwitterionic SCL micelles from a precursor block copolymer; [Type I SCL micelles which have anionic cores and cationic coronas, and Type II SCL micelles which have cationic cores and anionic coronas. Both types of micelles exhibited isoelectric points in aqueous solution. In this sense, they behave like synthetic proteins. Clearly this unusual aqueous solution behaviour offers considerable scope for the isolation, purification and harvesting of these zwitterionic SCL micelles in various applications]. (iii) Novel SCL micelles based on a water-soluble ABC triblock copolymer at high (10% w/v) [efficient inner shell cross-linking is achieved using BIEE and inter-micelle aggregation is prevented by the outer shell, which acts as a steric stabilizer].

References

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