COMB-LIKE SURFACTANTS COMBINING SIDE POLYETHYLENE GLYCOL AND POLYELECTROLYTE BRANCHES: SYNTHESIS, CHARACTERISTICS, AND APPLICATION AS NANOREACTORS AND CARRIERS

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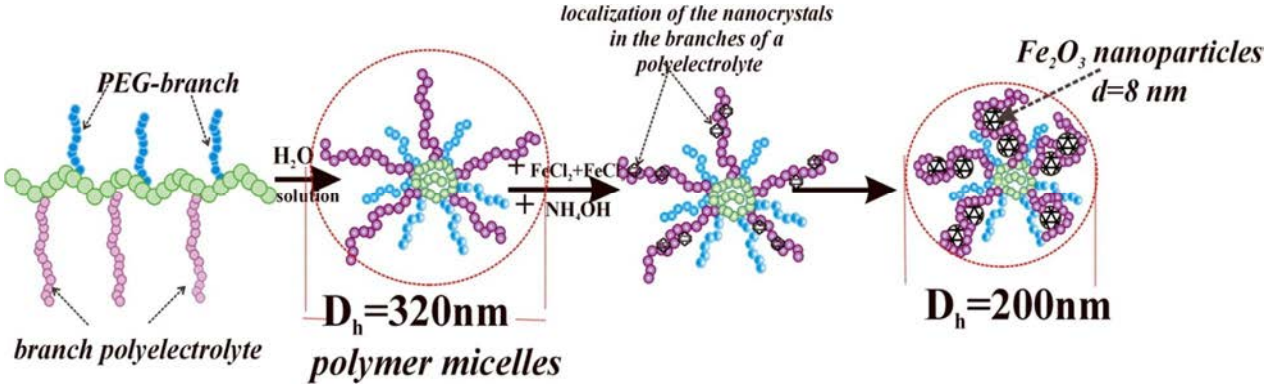
Branched polymeric surfactants composed of grafted non-ionic polyethylene glycol (PEG) and anionic polyelectrolyte chains were synthesized via radical polymerization initiated by the comb-like PEG-containing polyperoxide. Above definite concentration in solution, these surfactants form micelle-like structures (MLS). The MLS formed by branched polymeric molecules are of larger size in comparison with size of MLS formed by the initial PEG-containing polyperoxide that is caused mainly by different mechanism of their self-organization and morphology of formed MLS. The availability of grafted polyelectrolyte chains in the MLS provides a possibility of their use as the containers for immobilization of bio-active substances and nucleation of the inorganic nanoparticles, as well as formation of their stable colloidal systems in water in a wide pH range. Noticeable compaction and narrowed size distribution of the MLS were revealed after immobilization of doxorubicin (Dox) molecules or Fe_2O_3 nanocrystals. MLS-based systems were used for delivery of Dox and maghemite particles at treatment of tumor cells. Both MLS-based formulations of Dox and Fe_2O_3 were efficiently engulfed by rat glioma C6 cells. A significant (10 times) decrease in the effective therapeutic dose of Dox was found when this drug was delivered by a MLS-based formulation of Dox. That effect might be explained by a specific structure and functionality of the novel carrier used for immobilization of drug that should be delivered to target cells.



The scheme of the maghemite nanoparticle nucleation and functionalization