Self-assembled membranes from bionanoparticle-polymer conjugates

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New bionanoparticles have been prepared by using Horse spleen Ferritin (HSF) as a scaffold for grafting from of thermo-responsive poly(N-isopropyl acrylamide) (PNIPAAm) and photo-cross-linkable (2-(dimethyl maleinimido)-N-ethyl-acrylamide (DMIAAm).[1] The 72 addressable amino-groups on the exterior of HSF were modified to form a macro-initiator from which sequentially atom transfer radical polymerization was performed with NIPAAm and DMIAAm. The Ferritin-PNIPAAm conjugates display a thermo-responsive behaviour and possess a cloud point. Around this transition, dynamic light scattering displays an increasing hydrodynamic radius, indicating aggregation of the particles at elevated temperatures which was confirmed by transmission electron microscopy. Initial experiments show that the particles are highly surface active, much more than the individual components alone. The newly formed bionanoparticles-polymer composites are excellent candidates for the stabilization of polar/apolar interfaces[2] and in combination with photo-crosslinking, new materials can be developed for the formation of 2-D membranes or semi-permeable capsules.[3] Oil-in-water and water-in-oil emulsions have been prepared and stabilized by cross-linking, forming soft capsules which are stable enough to be collected, transferred and are able to endure co-solvents like ethanol.[1,2] The structures have high potential to be used as new delivery systems since the PNIPAAm is responsive to temperature, pH and salts.