Encapsulation of small molecules by poly(ethylene glycol)-*graft*-poly(vinyl acetate) unimer micelles

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Single chain nanoparticles are unimolecular nano-objects typically obtained by the self-folding of linear polymer chains that possess small pendant groups or longer side chain that can interact with each other via intra-chain interactions or by application of external stimuli. These systems are typically exploited in the mimicking of the hydrophobic compartments of biomacromolecules and in more technical applications (e.g., catalysis and nanomedicine)[1]. Although from an industrial point of view there is a growing attention towards these nano-carriers, for more technical applications the use of polymer chains with simplified structure and a higher concentration of particles than the typical 1 mg mL⁻¹ is recommended [2]. In this work we report on the formation of unimer micelles composed of amphiphilic poly(ethylene oxide)-*graft*-poly(vinyl acetate) copolymers with an extremely low degree of grafting that undergo self-folding in water driven by hydrophobic interactions only. This results in the formation of unimer micelles with a hydrodynamic diameter of about 20 nm. With respect to the typical linear complex-structured polymer chains, this material is best suitable for technical applications because of the simple molecular architecture and stability of unimeric micelle suspensions up to 100 mg mL⁻¹. The so-obtained single-chain globular particles are able to swell upon loading with small hydrophobic molecules, which could be of interest in the food and pharmaceutical industry.

Figure 1 Schematic representation of PEG-g-PVAc chains self-folding into unimer micelles and swelling upon loading of small hydrophobic molecules.

Acknowledgements The financial support of Procter & Gamble.