Title: “Synthesis of Dual Responsive Triblock Terpolymers for the Preparation of Amphiphobic Coatings”

Abstract:

Stimuli-responsive block copolymers are anticipated to fill a central role in the field of Materials Science. However, the synthesis and applications of stimuli responsive block copolymers are currently not well-explored. In particular, the synthesis of stimuli-responsive triblock copolymers incorporating a central fluorinated block is highly challenging. To address this issue, poly(ethylene glycol)-ONB-poly[2-(perfluorooctyl)ethyl methacrylate]-block-poly(2-cinnamoyloxyethyl methacrylate) (PEG-ONB-PCEMA) (PEG-ONB-PFOEMA-b-PCEMA or P1) was designed. The synthesis of (P1) was executed via ATRP. This reaction was novel in terms of the block sequences and compositions involved. The PEG block is water-soluble, while the PCEMA block is hydrophobic as well as photo-crosslinkable, and the PFOEMA block possesses a low surface tension. Meanwhile, ONB denotes a photo-cleavable o-nitrobenzyl unit placed at the junction between the PEG and PFOEMA blocks. Micelles of P1 were prepared in tetrahydrofuran/water solvent mixtures and their morphologies were examined via AFM and TEM techniques. In these dispersions, PEG formed the micellar corona, PFOEMA formed an intermediate shell domain, and PCEMA formed a central core. This micellar solution was exposed to UV light that triggered the crosslinking of the PCEMA block and induced the cleavage of the PEG block. In the next stage, applications of dual light-responsive P1 block copolymers were explored. Some of these applications included the preparation of amphiphobic films on glass surfaces, and the coating of textiles to render the fabrics with superhydrophobic
and oleophobic properties. Remarkably, these properties were achieved using only 0.4 wt.% of P1 on coated cotton.