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Thermo-responsive ABC triblock terpolymers for 3D printing

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Thermo-responsive polymers which respond to the temperature by forming physical gels are popular candidates for 3D printing. The sol phase facilitates the loading of the polymer-containing ink into the needle, whereas the gel phase contributes to the maintenance of the formed 3D structure. In this project, thermo-responsive ABC triblock copolymers polymers were synthesized via group transfer polymerization (GTP). The A, B and C blocks were based on a poly(ethylene glycol) (PEG) methacrylate, n-butyl methacrylate (BuMA) and 2-(dimethylamino)ethyl methacrylate (DMAEMA). Three different PEG based monomers were used as the A block; di(ethylene glycol) methyl ether methacrylate, penta(ethylene glycol) methyl ether methacrylate and nona(ethylene glycol) methyl ether methacrylate which are abbreviated as DEGMA, PEGMA and NEGMA, respectively. Systematic studies of the composition as well as the length of PEG side group were carried out. Three different compositions as well as three different PEG based monomers were used, resulting in nine ABC triblock copolymers. The molecular weight (MW) and the architecture were kept constant. Their values were determined by previous studies carried out by the group which showed that these parameters induce the clearest sol-gel transition. The effect of the PEG side group length and the composition on the thermo-responsive behavior of the resulted polymers was investigated. Both parameters proved to affect the sol-gel transition. More specifically, the thermo-responsive behavior was favored by decreasing the PEG side group length and by increasing the hydrophobic content as expected.

Biography

Anna Constantinou has obtained her BSc degree in Chemistry from the University of Cyprus in 2014 and MSc in Advanced Materials Science and Engineering from Imperial College London (ICL). She is currently pursuing her PhD degree in Polymer Chemistry at the Department of Materials at ICL.

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