

Polypeptoid polymers: Development of new chemistry and functional materials

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Abstract: Polypeptoids, featuring N-substituted polyglycine backbones, have emerged as a new peptidomimetic platform for macromolecular science and engineering. The physicochemical properties of polypeptoids are strongly dependent on the sidechain structure, allowing for control and adjustment of the chain conformation, HLB and charge characteristics, solubility and thermal properties. Recent advances in the controlled polymerization to produce well-defined polypeptoids and the design, synthesis and characterization of functional polypeptoids towards certain biomedical applications will be presented and discussed (Figure). Specifically, I will discuss the development of alcohol-initiated ring-opening polymerization (ROP) of N-substituted N-carboxyanhydride using organo promoters and the synthesis of hetero-block copolymers comprised of polypeptoid segments using this method; the synthesis and characterization of cyclic polypeptoids use improved organo-mediated zwitterionic ROP methods; the design and synthesis of AB or ABC-type polypeptoid-based block copolymers and their stimuli-responsive self-assembly in aqueous solutions to form micelles or micellar networks. These materials are useful for drug delivery or tissue engineering applications.

