SYNTHESIS, KINETICS, AND BIOMEDICAL APPLICATIONS OF NANOPARTICLES FROM DEGRADABLE MACROMERS

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ABSTRACT

Semi-batch radical emulsion polymerization is used to produce nanoparticles (NPs) with tunable dimension, hydrophobicity, and degradation from copolymerization of novel poly(ε-caprolactone) (PCL) or poly(lactide) (PLA) based macromonomers with PEGylated 2-hydroxyethyl methacrylate (HEMA-PEG) in a surfactant-free process. Macromonomers include a vinyl end-group amenable to radical polymerization, degradable CL or LA units with tunable length, and a terminal end-group with alkyl, hydroxyl, carboxyl, or fixed cationic charge functionality. NP final properties, such as degradation, are controlled by the number of degradable units in the macromonomer as well as the identity of the terminal functionality. Thus, the pulsed-laser polymerization (PLP) technique is employed to study the copolymerization kinetics for this family of macromonomers. Copolymer microstructure, functional group placement, and rate data are used to better understand NP performance during *in vitro* and *in vivo* anti-cancer drug delivery therapies.