Porous amphiphilic biogel from a facile chemo-biosynthetic route

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Abstract: Grafting of medium-chain-length poly-3-hydroxyalkanoates (mcl-PHA) with glycerol 1,3-diglycerolate diacrylate (GDD) in acetone was performed using benzoyl peroxide as the initiator. A detailed mechanism scheme provides significant improvement to previous literature. Radical-mediated grafting generated α-β carbon inter-linking of mcl-PHA and GDD, resulting in a macromolecular structure with gel properties. The thermal properties of the copolymer for different graft yields were investigated as a function of initiator concentration, GDD monomer concentration, incubation period and temperature. The water absorption and porosity of the gel were significantly improved relative to neat mcl-PHA.

Keywords: biogel; chemo-biosynthetic; biopolymer; radical grafting.

INTRODUCTION

Polyhydroxyalkanoates (PHA) are well-known biopolymers with attractive biocompatibility. They are accumulated within certain bacterial species in the form of granules when the microorganisms experience imbalanced growth conditions, viz., simultaneous excess carbon source and limitation of nutrients such as nitrogen and phosphorus.¹⁻⁴ Two categories of PHA could be differentiated, i.e., short-chain-length polyhydroxyalkanoates or scl-PHA, comprising of monomers with four- to five-carbon atom length, and medium-chain-length polyhydroxyalkanoates or mcl-PHA, made up of 6- to 14-carbon atom length monomers.² Modification and functionalization of PHA, intended for tuning the features, are

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