Biodegradable copolymers made with magnesium complexes

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In this study, a *bis*-ligated magnesium complex was used to initiate the ring opening copolymerization of L-lactide (L-LA) and ϵ-caprolatone (ϵCL) and the isolated polymeric materials were characterized with NMR spectroscopy. First, the simultaneous feeding of both monomers resulted in the synthesis of homopolymer poly-lactic acid (PLA). Polymerization experiments with sequential addition of L-LA and ϵCL yielded surprising results. The ring opening polymerization of ϵCL yielded poly-caprolactone (PCL) which with the addition of L-LA yielded a di-block copolymer of PCL and PLA. The presence of the two homopolymer blocks in the copolymer was identified with ^{13}C NMR where C=O signals corresponding to only caprolyl or lactyl linkages were observed. Reversing the order of monomer addition (L-LA followed by ϵCL) yielded only PLA homopolymer with no conversion of ϵCL into polymer. These results were consistent with a recent report that proposed a lactide-magnesium chelate formation, which blocked ϵCL coordination to the metal center. All of the isolated polymeric materials were characterized with gel permeation chromatography to determine the number average molecular weight and the poly-dispersity index values.

Keywords: polymers, magnesium complexes, NMR