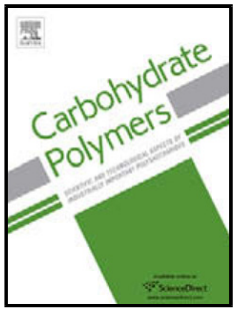

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Controlled graft copolymerization of lactic acid onto starch in a supercritical carbon dioxide medium

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ABSTRACT

This work presents a new approach for the synthesis of a starch-*g*-poly L-lactic acid (St-*g*-PLA) copolymer via the graft copolymerization of LA onto starch using stannous 2-ethyl hexanoate ($Sn(Oct)_2$) as a catalyst in a supercritical carbon dioxide ($scCO_2$) medium. The effects of several process parameters, including the pressure, temperature, $scCO_2$ flow rate and reaction time, on the polymerization yield and grafting degree were studied. Amorphous graft St-*g*-PLA copolymers with increased thermal stability and processability were produced with a high efficiency. The maximum grafting degree (i.e., 52% PLA) was achieved with the following reaction conditions: 6 h, 100°C, 200 bar and a 1:3 (w/w) ratio of St/LA. It was concluded that these low cost biobased graft biopolymers are potential candidates for several environmentally friendly applications.

Keywords: graft copolymerization, starch, lactic acid, supercritical carbon dioxide