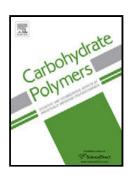
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ACCEPTED MANUSCRIPT

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

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16 ABSTRACT

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This work presents a new approach for the synthesis of a starch-g-poly L-lactic acid (St-g-PLA) 18 copolymer via the graft copolymerization of LA onto starch using stannous 2-ethyl hexanoate 19 $(Sn(Oct)_2)$ as a catalyst in a supercritical carbon dioxide (scCO₂) medium. The effects of several 20 process parameters, including the pressure, temperature, scCO₂ flow rate and reaction time, on 21 the polymerization yield and grafting degree were studied. Amorphous graft St-g-PLA 22 copolymers with increased thermal stability and processability were produced with a high 23 efficiency. The maximum grafting degree (i.e., 52% PLA) was achieved with the following 24 25 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 26 friendly applications. 27

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

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