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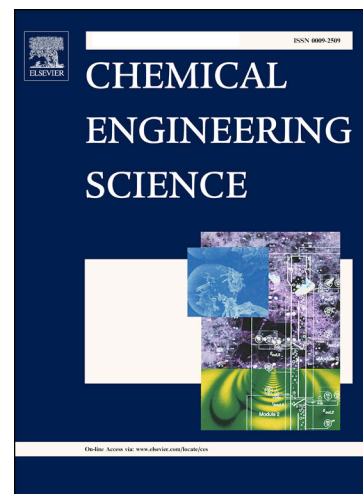
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## Continuous enzymatic synthesis of polycaprolactone in packed bed reactor using pressurized fluids

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### Abstract

Continuous processing of reagents allows high reaction yields and better operational process control, allied with cost reduction compared to batch mode. In this work, a packed-bed reactor (PBR) system using Novozym 435 for enzymatic ring-opening polymerization (e-ROP) of  $\epsilon$ -caprolactone ( $\epsilon$ -CL) with dichloromethane as a cosolvent in supercritical CO<sub>2</sub> (scCO<sub>2</sub>) or in *n*-butane media, was investigated. The reactions carried out in scCO<sub>2</sub> reached yields above 93 wt%, average molecular weight ( $M_n$ ) of up to 31.2 kDa and polydispersity ( $D$ ) from 1.4 to 1.6 for only 15 min processing. The apparent monomer conversion rate constant ( $k_{app}$ ) ranged from 0.094 to 0.180 min<sup>-1</sup>. Otherwise, reactions performed with *n*-butane provided yields above 80 wt%,  $M_n$  values of 25.4 kDa and  $D$  in the range of 1.4 - 1.6, also obtained for 15 min of reaction. The maintenance of high yields and molecular weights for up to 6 enzymatic reuses were obtained for both systems studied.

*Keywords:* e-ROP; PBR; Novozym-435;  $\epsilon$ -CL; supercritical carbon dioxide; *n*-butane.

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