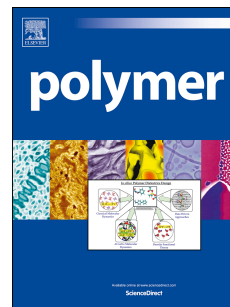


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Automatic, simultaneous control of polymer composition and molecular weight during free radical copolymer synthesis

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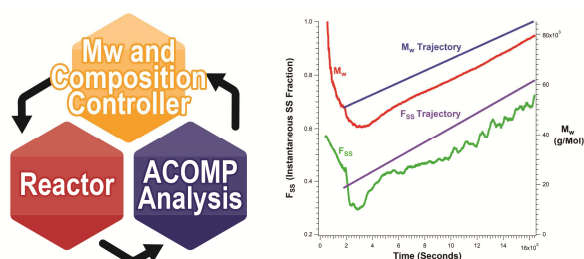
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### Abstract

Fully automatic, simultaneous control of polymer composition and molecular weight trajectories during free radical copolymer synthesis was achieved by coupling the continuous ACOMP data stream into a feedback controller which operated pumps for reactor feed of comonomers. The controller operates without recourse to a detailed kinetic model or reactivity ratios. Rather, it uses the fact that instantaneous copolymer chain composition is related to the instantaneous rate of consumption of comonomers, and the rate for each of these is described by rates  $\alpha_1$  and  $\alpha_2$  for comonomers 1 and 2, respectively. The instantaneous weight average molecular weight  $M_{w,inst}$  is proportional to total comonomer concentration via a constant  $p$ . Hence, target trajectories for composition and  $M_w$  can be independently prescribed and followed. Since  $\alpha_1$ ,  $\alpha_2$  and  $p$  are directly measurable from the ACOMP data stream, their values can be constantly updated by the automatic controller during the reaction process to insure the target trajectories are followed.



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