

Controlled Styrene Polymerization using Trifunctional Initiator

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Abstract

Controlled or Living Free Radical Polymerization (LFRP) has received attention as a technique for the production of polymers with microstructure highly controlled. In particular, narrow molecular weight distributions are obtained with polydispersity very close to one. In this work a study in experimental level to investigate the controlled polymerization mediated by nitroxides (NMRP) was performed, using a trifunctional cyclic peroxide. The effect of the dissociation rate constant of the trifunctional initiator on velocity of reaction was analyzed, taking into account the effect of the recombination of the peroxides groups. As initiator it was used the Trigonox 301 (3,6,9-Triethyl-3,6,9-trimethyl-1,4,7-triperoxonane), that is very peculiar because it is able to generate a large quantity of radicals if compared with mono- and bi-functional initiators. Besides, the Trigonox 301 presents a cyclic chemical structure with three oxygen – oxygen bonds, which can break easily, releasing, therefore, six free radicals by molecule. The TEMPO (2,2,6,6, tetrametil-1-piperidinoxil) was used as controller. The experimental conditions studied took into account variation on temperature, controller/initiator ratio and concentration of initiator.

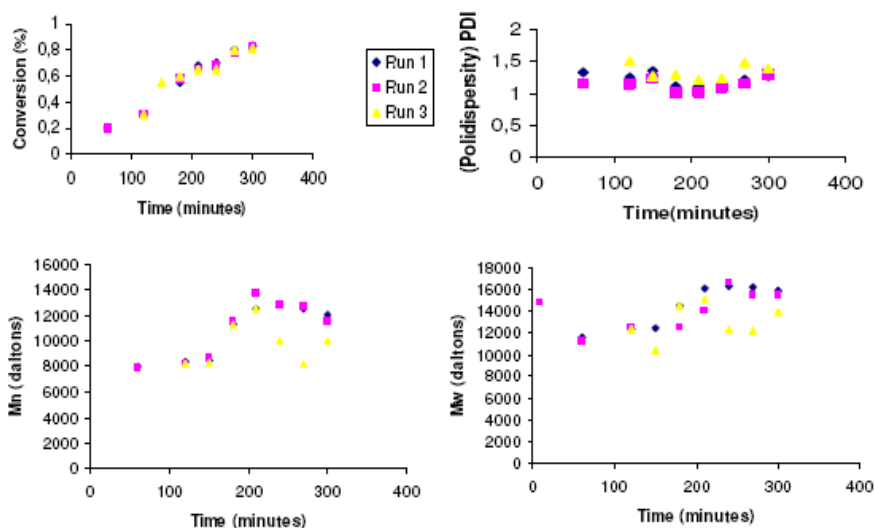


Figure 1: Results obtained to controlled process.

Experiments were performed in triplicate and the results are shown on Figure 1, where we can see profiles of conversion, molecular weights and polydispersity over time. A controlled process is only reached at certain operating conditions, related to a higher concentration of initiator.

References

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