



ELSEVIER

Available online at www.sciencedirect.com

SCIENCE @ DIRECT®

Polymer 46 (2005) 10553–10560

polymer

www.elsevier.com/locate/polymer

Decomposition of 2,5-dimethyl-2,5-di(2-ethylhexanoylperoxy)hexane and its use in polymerization of styrene and methyl methacrylate

Weichen Sheng*, Guorong Shan, Zhiming Huang, Zhixue Weng*, Zuren Pan

Polymer Reaction Engineering Division, State Key Laboratory of Chemical Engineering, Department of Chemical Engineering, Zhejiang University, Hangzhou 310027, People's Republic of China

Received 30 December 2004; received in revised form 9 June 2005; accepted 5 August 2005

Available online 19 August 2005

Abstract

A new radical initiator, 2,5-dimethyl-2,5-di(2-ethylhexanoylperoxy)hexane (DMDEHPH), has been used to initiate styrene (ST) and methyl methacrylate (MMA) polymerization in the temperature range of 50–80 °C and DMDEHPH concentration range of 0.005–0.100 mol/L. The effects of initiator concentration, monomer concentration and reaction temperature on the polymerization rate were investigated in details. The increase of these three parameters will all increase the polymerization rate. The orders of polymerization rate to peroxide group concentration and monomer concentration were found to be 0.5 and 1.0, respectively, which validates the correctness of kinetic model derived from the mechanism of polymerization. The activity energy obtained from the polymerization rate constants at various temperatures is 92.0 kJ/mol for ST and 81.4 kJ/mol for MMA. The initiator efficiency is in the range of 0.55 ± 0.03 for ST and 0.43 ± 0.02 for MMA under the experiment conditions. And the initiator efficiency decreases with the increase of initiator concentration.

© 2005 Elsevier Ltd. All rights reserved.

Keywords: Initiator efficiency; Modeling; Polymerization kinetics