Copolymerization of 2 – hydroxy – propyl methacrylate/styrene with nitroxy radical monitored by FTIR in situ

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Recently, Veregin[1] and Grubbs[2] have reported a useful and convenient route to prepare polystyrene with narrow polydispersity by living free radical polymerization with a nitroxy radical respectively. But it is very difficult to obtain polyacrylate with high relative molecular mass by such a method, owning to the abstracting hydrogen reaction of nitroxy radical to the acrylate radical. In this study, the radical copolymerization system of 2 – hydroxy – propyl methacrylate(HPMA)/styrene in presence of hydroxyl 2, 2, 6, 6 – tetramethylpiperidinyloxyl (HTEMPO) is chosen and the reaction kinetics was monitored in situ by FTIR. Fig 1 shows the absorption peak at 910 cm⁻¹ for styrene double bond vibration and at 810 cm⁻¹ for HPMA decrease gradually with increase of reaction time respectively. The dependence of absorption area on double bond concentration was quantity on Beer – Lambert law. The relative molecular mass for HPMA/St systems is proportion to the total conversions as shown in Fig 2 and the relative molecular mass distributions(MWD) is less than 1.5 in the initiation range of conversion(less than 50%).

![FTIR spectrogram of polymerization proceeds](image)

Fig 1 FTIR spectrogram of polymerization proceeds

![Graph showing M₅ and MWD of copolymer](image)

Fig 2 M₅ and MWD of copolymer

Reaction conditions: 120 ℃, St : HPMA : HTEMPO : AIBN : DCPO = 350 : 150 : 1.2 : 0.91 : 0.09.

However, in high conversion MWD increases and even over 2. 0, due to the hydrogen transfer reaction of the propagating HPMA radical[2].

References

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