

Polymerization of Vinyl Monomers Initiated with Phosphonium-based Ionic Liquids

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As a typical example, the fact that phosphonium-based ionic liquid such as trihexyl(tetradecyl)phosphonium chloride ([P(h3)t]Cl) has the initiating ability of radical polymerization was clarified for the first time. As a preliminary experiment for this study, the radical polymerization of methyl methacrylate (MMA) initiated with benzoyl peroxide, which is the widely used traditional radical polymerization initiator, was carried out. From the experiment, it could be confirmed that the polymerization revealed the well-known radical polymerization behaviors in which the polymerization proceeded more smoothly under argon atmosphere than under air atmosphere, and the polymerization rate increased with increasing the initiator concentration. In the meanwhile, the polymerization of MMA initiated with [P(h3)t]Cl tended to proceed under air atmosphere rather than under nitrogen atmosphere. That is, the polymerization behavior was different from that of traditional radical polymerization. However, the effects of radical polymerization inhibitors, a radical chain transfer agent, and the polymerization temperature strongly suggested that the polymerization proceeds via a radical pathway. On the other hand, since the strong solvent dependence of the polymerization reaction was different from the traditional radical polymerization behavior, the experiments were conducted in a mixed solvent system. As an attractive result, it was found that the polymerization reaction can be controlled by the amount of *N,N*-dimethylformamide. Through this investigation, it could be discovered that [P(h3)t]Cl is a novel attractive initiator of radical polymerization.