

Novel Radical Polymerization of Methyl Methacrylate Initiated with 1-Ethyl-2,3-dimethylimidazolium Bromide as an Ionic Liquid

Kousuke SASAKI

Imidazolium-based ionic liquid such as 1-ethyl-2,3-dimethylimidazolium bromide ([edmim]Br) was used as the radical polymerization initiator of methyl methacrylate (MMA) for the first time. As the comparative experiment, the traditional radical polymerization of MMA initiated with 2,2'-azobis(isobutyronitrile) was examined and confirmed to proceed more smoothly under nitrogen atmosphere than under air atmosphere. In contrast to the fact, the [edmim]Br-initiated polymerization of MMA in *N,N*-dimethylformamide proceeded more smoothly under air atmosphere than under nitrogen atmosphere. Furthermore, it could be confirmed the characteristic polymerization behavior such as the initiator concentration dependence to the polymerization rate and the solvent dependence to the polymerization activity. These polymerization behaviors were also different from those of traditional radical polymerization. In the meanwhile, the addition of radical polymerization inhibitors such as BHT and hydroquinone completely inhibited the polymerization. Furthermore, the addition of the radical chain transfer agent such as 1-dodecanethiol significantly reduced the molecular weight of the resulting polymer. Considering the results obtained through this study, it can be concluded that the MMA-polymerization initiated with [edmim]Br is the unique radical polymerization that proceeds under air atmosphere. On the other hand, as an index for clarifying the polymerization mechanism, the polymerization initiating ability of 1-ethyl-2,3-dimethylimidazolium tetrafluoroborate was examined. As the result, the polymerization hardly proceeded, suggesting that the anion structure of the ionic liquid has the important role on the polymerization initiating ability.