ABSTRACT

Poly(methyl methacrylate) (PMMA) is an important polymer which is lightweight, transparent and is biocompatible. This thesis reports the synthesis of tailor-made poly(methyl methacrylate) (PMMA), its block and graft copolymers via activators regenerated by electron transfer atom transfer radical polymerization (ARGET ATRP). The effect of solvents and temperature on its polymerization kinetics of ARGET ATRP of MMA was studied. It was obtained that the rate of the polymerization was increased with time and highest rate of polymerization was obtained when DMF was used as a solvent. The polymer prepared via ARGET ATRP was used for the study of different microstructures present using 1D and 2D NMR spectroscopy. ^{13}C NMR along with ^{1}H NMR spectroscopy has been used extensively to extract the information about the different microstructures present in PMMA. Different methods such as Heteronuclear multiple-bond correlation (HMBC), heteronuclear single-quantum coherence (HSQC), and total correlation spectroscopy (TOCSY) were used to study the position of protons, couplings with carbon etc. in the PMMA. Atom transfer radical copolymerization (ATRcP) of MMA and Poly(ethylene glycol) (PEG) was also successfully carried out using modified polyethylene glycol (PEG) as initiator at 70 ºC in DMF. The prepared macroinitiator was characterized by FT-IR and NMR analyses for its structural analyses. ABA type tri-block copolymers of PEG with MMA were prepared via ARGET ATRP based on macroinitiator. The purified block copolymer was analyzed by FT-IR, ^{1}H NMR, ^{13}C NMR, TGA, MALDI-TOF and SEM analyses. Atom transfer radical graft copolymerization (ATRgP) of MMA was successfully carried out on bromo functionalized Starch to prepare graft copolymer. The prepared and purified grafted co-polymer and macroinitiator was analyzed by FT-IR and ^{1}H NMR analyses for structural elucidation. Thermal properties were evaluated by TGA and DSC analyses and morphological study was carried out by SEM analysis.

KEY WORDS: atom transfer radical polymerization (ATRP), activators regenerated by electron transfer atom transfer radical polymerization (ARGET ATRP), heteronuclear multiple-bond correlation (HMBC), heteronuclear single-quantum coherence (HSQC), total correlation spectroscopy (TOCSY), poly(methyl methacrylate) (PMMA), block copolymer, graft copolymer