

NITROXIDE MEDIATED POLYMERIZATION OF METHACRILAMIDE

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Controlled radical polymerization (CRP) facilitated the synthesis of various functional polymers with predictable molecular weights and narrow molecular weight distribution. The Nitroxide Mediated Polymerization (NMP) is one of the most prospective techniques of CRP. NMP method involves a combination of radical initiator (I), monomer (M) and a stable nitroxide radical (R) for trapping of intermediate radical species.

Synthesis of poly(methacrylamide) (PMAA) via NMP was carried out with 2,2'-azobis-(2-methylpropionitrile) (AIBN) and benzoyl peroxide (BPO) as radical initiators, methacrylamide (MAA) as a monomer, and (2,2,6,6-tetramethylpiperidin-1-yl)oxyl (TEMPO) as mediator. We investigated the influence of initiator's nature, temperature, reaction time and molar ratio of the components on the yield of the acquired product. The effect of the temperature and reaction kinetics was also investigated. The polymers synthesized were explored by means of H^1 nuclear magnetic resonance (NMR) spectroscopy and Fourier-transform IR-spectroscopy (FTIR). Thermal stability of the obtained polymers was determined using thermogravimetric analysis (TGA) and pyrolytic mass spectrometry. TGA method demonstrated that PMAA-TEMPO had an additional stage of thermal destruction in the region of 110-130 °C, which one was absent at the thermogram of PMAA sample. This fact confirmed that TEMPO performed as mediator of polymerization forming an intermediate stable below 110 °C.