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Graft Copolymerization of N-Vinylimidazole on Poly(Ethylene Terephthalate) Fibers in a Swelling Solvent Using Azobisisobutyronitrile as Initiator

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Abstract: In this study, poly(ethylene terephthalate) (PET) fibers were grafted in dimethylformamide (DMF) with n-vinylimidazole (n-VI) using azobisisobutyronitrile (AIBN) as an initiator. Variations of percentage grafting with time, temperature, monomer and initiator concentrations as well as monomer and initiator diffusions were investigated. It was observed that the percentage of grafting and grafting efficiency increased as time and temperature rose up to a certain value, and then they levelled off. The percentage of grafting was found to rise with increasing monomer and initiator concentrations, and then decrease. Monomer and initiator diffusions into PET fibers were shown to follow a similar trend and increased the percentage of grafting. Optimum conditions for grafting was found to be [n-VI] = 0.5 M, $[AIBN] = 1.5 \times 10^{-3} \text{ M}$, T = 70 °C and t = 3 days. The rate of grafting was found to be proportional to 1.4 and 0.7 powers of monomer and initiator concentrations, respectively. The overall activation energy for grafting was 22.2 kcal/mol. Further changes in the properties of grafted PET fibers such as intrinsic viscosity, water absorption capacity, fiber diameter and elongation percentage were determined. Grafted fibers were characterized by FTIR spectroscopy and scanning electron microscopy.

Key Words: Graft copolymerization, n-vinylimidazole, radical polymerization, swelling, PET fiber

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