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Phase Transfer Catalyzed Polymerization of Acrylonitrile Initiated by Potassium Persulfate–N, N, N-Trimethylhexadecan-1-Ammonium Chloride in Diphase System: A Kinetic Study

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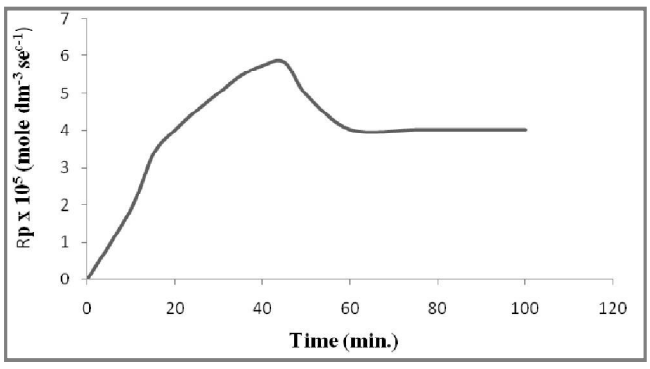
ABSTRACT

The polymerization of acrylonitrile (AN) has been studied under phase transfer reaction condition. The suitable reaction conditions and the kinetics of free radical polymerization of acrylonitrile using N, N, N-trimethylhexadecan-1-ammonium chloride (TMHDAC) - potassium peroxydiphosphate (PDP) as free radical initiator have also been assessed and discussed. The influence of concentrations of the monomer, initiator, catalyst, variation of temperature and solvent polarity on polymerization rates were determined and verified with the experimental results. Based on these results a suitable kinetic mechanism has been proposed. The reaction order with respect to monomer, initiator and phase transfer catalyst concentrations were found to be 1, 0.5 and 0.5 respectively. Herein, the polymer products yield with improved properties and checked by various instrumental studies viz., UV, IR, ^{1}HNMR, ^{13}CNMR and viscosity measurements.

Graphical Abstract



Steady state rate of polymerization

Keywords: Phase transfer catalysis, Peroxydiphosphate (PDP), Acrylonitrile, Mechanism of free radical polymerization, Spectral studies.