THERMAL DEGRADATION STUDIES OF COPOLYMER RESIN-III DERIVED FROM 8-HYDROXYQUINOLINE 5-SULPHONIC ACID-THIOSEMICARBAZIDE-FORMALDEHYDE

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Abstract

The Copolymer (p-HBSF) was synthesized by condensation of p-hydroxybenzoic acid and semicarbazide with formaldehyde in the presence of 2M HCL as a catalyst at 126±2 ^{0}C for 5 hrs. with molar proportion of reactants. The synthesized copolymer resin has beencharacterized by different physico-chemical techniques. Thermogravimetric analysisof all copolymer resins in present study have been carried out by non-isothermalthermogravimetric analysis technique in which sample is subjected to condition ofcontinuous increase in temperature at linear rate. Thermal study of the resins wascarried out to determine their mode of decomposition and relative thermal stabilities. The copolymer (p-HBSF) was characterized by FT-IR, ^{1}H-NMR Spectroscopy.The thermal decomposition behavior of copolymer was studied by using TGA in static nitrogen atmosphere at a heating rate of 10^{0}C/min. The advantage ofFreeman-Carroll method is to calculate both the order of reaction (n) and energyof activation in one single stage by keeping heating rate constant. Thermal activation energy (Ea) calculatedwith above two mentioned methods are in close agreement. Freeman Carroll and Sharp-Wentworth methods were used to calculate the thermal activation energy(Ea),the order of reaction(n), entropy Change (ΔS), free energy change (ΔF), apperent entropy change (ΔS), and frequency factor (Z). The thermal activation energy determined with the help of these method was in good agreement with each other.

Keywords: Synthesis, condensation, thermogravimetric analysis,activation energy,decomposition, resins.

INTRODUCTION

Thermogravimetric analysis has been widely used to investigate the decomposition characteristics of polymeric matter .Copolymers, very special classes of polymers, are known for their versatile uses and arefound to be amorphous, crystalline or resinous in nature. Phenolic resins have been theworkhorse as matrix resins in composites for structural and thermal applications inaerospace because of their ease of processability, thermal stability, versatile characteristicsand cost effectiveness. W. Tang and coworkers studied the thermal decomposition kineticsof thermotyropiccopolyesters made from trans-*p*-hydrocinnamic acid and *p*-hydrobenzoicacid[1-2]. Copolymers occupy an intermediate position between organic and inorganiccompounds and it is hoped that the study of copolymers will lead to the production of polymer,which are both thermally stable and useful as fabricating materials. P. E. P. Michael *et al.*studied synthesis, characterization and thermal degradation of 8-hydroxyquinolineguanidine-formaldehyde copolymer[3]. Rahangdale and coworkers studied thermaldegradation of copolymers derived from 2, 4-dihdroxyacetophenone, dithioxamide andformaldehyde[4].Copolymers can be used as high energy material, ion-exchanger, semiconductors,antioxidants, fire proofing agent, optical storage data, binders, molding