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Research Article

SYNTHESIS, CHARACTERIZATION AND THERMAL DEGRADATION STUDIES OF COPOLYMER DERIVED FROM 2, 4-DIHYDROXY PROPIOPHENONE AND 4-PYRIDYLAMINE

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ABSTRACT

The copolymer DHPPAF has been synthesized by condensation of 2,4-dihydroxypropiophenone,4-pyridyl amine with formaldehyde in the presence of 2M HCl as a catalyst at125 ± 20C in 1:1:2 molar proportion of reactants. The structure of newly synthesized copolymer has been elucidated and confirmed on the basis of elemental analysis and various spectral techniques, that is, UV-Visible, FT-IR, and 1H-NMR spectroscopy. The thermal degradation kinetics of the copolymer has been investigated by thermo gravimetric analysis (TGA) in a static nitrogen atmosphere at a heating rate of 100 C/min. Sharp-Wentworth and Freeman-Carroll methods have been used to evaluate the kinetic and thermodynamic parameters such as thermal activation energy (Ea), entropy change (ΔS), free energy change (ΔF), apparent entropy change (S*), frequency factor (Z) and order of reaction(n). The activation energy calculated by Sharp-Wentworth and Freeman-Carroll methods are in close agreement with each other. The order of decomposition reaction is found to be 0.96.

INTRODUCTION

The copolymer resin has been attracting much attention of polymer chemist due to interesting superior properties that can fulfill the demand of modern society[1]. Since last two decades, emphasis has been given on synthesis of thermally stable copolymeric resins with reference low production cost and ease of manufacture. The thermal degradation study of copolymer which primarily decides the thermal stability, processability andimportant information about its practical applicability. A large number of copolymers have been synthesized and find many applications such as adhesives, packaging, coating in electrical sensors, catalyst, activators, thermal stable materials [2,3], ion-exchangers[4,5], high dielectric constant for energy storage capacitors [6] and semiconductors [7].The considerable afford has been made to improve the quality of copolymer either by introduction of avarietyof functional monomers or by modifying methods. The thermal stability of copolymer have been studied by using the method of thermo gravimetric analysis (TGA) by several authors [8-15].

P. U.Belsare and coworkers studied the thermal degradation of terpolymer derived from 2-aminothiophenol, hexamethylenediamine with formaldehyde [16].Synthesis and thermal degradation studies of melamine formaldehyde resin has been reported by S.Ullah *et al* [17]. The thermal behavior of newly synthesized copolymer derived from salicylic acid and thiosemicarbazide has been studied by Kamlakar *et al* [18]. A. Gupta and coworkers studied the thermal degradation and kinetics of terpolymer resin derived from p-hydroxybenzaldehyde, succinic acid with ethylene glycol [19]. Thermo gravimetric analysis of terpolymer resin derived from salicylic acid, hexamethylenediamine with formaldehyde by D. T.Masram [20], 8-hydroxyquinoline and formaldehyde by P. E. P. Michael *et al* [21] and salicylic acid, diaminonaphthalene with formaldehyde by D. T.Masram [22] have been reported. The study of non-isothermal decomposition and kinetic

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