

NON-ISOTHERMAL KINETIC STUDIES OF NOVEL O-TMF COPOLYMER

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ABSTRACT

The Copolymer (o-TMF) was synthesized by condensation of o-toluidine and melamine with formaldehyde in the presence of 2M HCL as a catalyst at $124 \pm 2^\circ\text{C}$ for 5 hrs with molar proportion of reactants. Thermogravimetric analysis of copolymer resin in present study has been carried out by non-isothermal thermogravimetric analysis technique in which sample is subjected to condition of continuous increase in temperature at linear rate. Thermal study of the resins was carried out to determine their mode of decomposition and relative thermal stabilities. The copolymer (o-TMF) was characterized by FT-IR, ¹H-NMR Spectroscopy. Thermal activation energy (Ea) calculated with 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), apparent 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, Kinetic parameter.

INTRODUCTION

The thermal degradation study of copolymers has become a subject of interest. Study of thermal behaviour of copolymers in air at different temperature provides information about the nature of species produced at various temperatures due to degradation. Copolymers having good thermal stability and catalytic

activity have enhanced the development of polymeric materials. [1-3].

The study of thermal behaviour of copolymers in air at different temperature provides information about the nature of species produced at various temperatures due to degradation. Copolymers having good thermal stability and catalytic activity have enhanced the development of polymeric materials. Copolymers of salicylic acid, thiourea with trioxane and p-hydroxybenzoic acid, thiourea with trioxane have been reported in the literature [4-7]. Synthesis, characterization and ion exchange properties of 4-hydroxyacetophenone, biurel and formaldehyde terpolymer resin were studied by Gurnule and coworkers [8]. Thermal degradation of m-nitroaniline, m-chloroaniline and m-aminophenol has been studied by Dash *et al.* [9] and 2-hydroxyacetophenone, oxamide and formaldehyde [10]. S. L. Oswalet *et al.* synthesized and studied thermal properties of copolymer (maleimide methylmethacrylate), terpoly (maleimide methylmethacrylate-acrylic acid) and terpoly (maleimide methylmethacrylate-methyl-acrylic acid). The thermal behaviour was studied by TG and DSC techniques. Various researchers have been studied the applications of polymer resins of substituted phenols and formaldehyde [11].

The present paper deals with the synthesis, characterization, and non-isothermal thermogravimetric analysis of copolymer derived from o-toluidine and melamine (T) with formaldehyde (F). However, the literature studies have revealed that no copolymer has been synthesized by using the said monomers. Sample is subjected to thermal degradation data with Sharp-Wentworth (SW) and Freeman-Carroll (FC) methods, activation energy and