

Thermal Degradation Studies of Copolymer Derived from 2,2'-Dihydroxybiphenyl, Ethylenediamine and Formaldehyde

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Abstract: Copolymer (2,2'-BPEDF) was synthesized with molar ratio 3:1:5 of monomer 2,2'-dihydroxybiphenyl (BP), ethylenediamine (ED) and formaldehyde (F) by condensation polymerization, in acidic medium and refluxing in oil bath at 120°C for 5 h. Composition and structure of organic copolymer have been determined by elemental analysis and molecular weight determination by non-aqueous conductometric titration method. The UV-visible, FTIR and proton nuclear magnetic resonance (¹H NMR) spectra were studied to elucidate the structure. The surface features and crystalline behaviour of the copolymer was analysed by scanning electron microscope (SEM). Non isothermal thermogravimetric analysis for determination of their mode decomposition and relative thermal stability, Energy of activation, frequency factor and order of reaction have been calculated by Sharp-Wentworth (SW) and Freeman-Carroll (FC) methods. Energy of activation determined by Sharp-Wentworth and Freeman-Carroll methods are in agreement with each other. The order of reaction is found to be 0.98.

Keywords: Synthesis, Thermal, ethylenediamine, Kinetic parameter, Polycondensation, structure, composition, Thermal stability.

I. INTRODUCTION

Investigation of thermogravimetric analysis includes a gathering of methods in which an actual property of substance is estimated as a component of temperature when the substance is exposed to a controlled temperature program. Thermally stable copolymers have as of late become shelter to polymer physicist because of their superior and elite utility. Since the advanced history of thermogravimetry, thermogravimetric analysis of polymers and the investigation of their energy have been at the focal point of thermogravimetric investigation. Numerous specialists attempted to work on the thermogravimetric analysis at raised temperature by changing the monomer organization in polymer combination [1].

The thermogravimetric analysis of copolymer has gotten a subject of ongoing premium, being a significant property, which fundamentally chooses thermogravimetric steadiness and processability. A wide assortment of thermally stable polymers have been combined and examined their thermogravimetric property and discovers numerous applications, for example, particle exchangers [2-5], semiconductors [6], high dielectric consistent for energy stockpiling capacitors [7], bundling, cements and coatings in electrical sensors, activators, impetuses and thermally stable materials [8-10]. Thermogravimetric analysis of copolymer tars got from 2,4-dihydroxyacetophenone, dithiooxamide, and formaldehyde by Rahangdale et al. [11], Jinger et al. completed thermogravimetric analysis of terpolymers combined from azo-n-4-bromophenyl substituted maleimide with acrylates [12, 13]. Phenolic saps are known for their wide applications in different regions due to their thermogravimetric strength, simple accessibility, cost adequacy, and a portion of their incredible properties [14]. The thermogravimetric strength of terpolymers has been widely concentrated by utilizing the technique for thermogravimetric investigation (TGA) by a few creators.

Thermogravimetric insightful and dynamic investigations of terpolymer pitches got from 8-hydroxyquinoline-5-sulphonic acid/p-cresol, oxamide/melamine with formaldehyde have been detailed by Singru et al. [15-18]. 2-hydroxy, 4-methoxybenzophenone, 1,5-diaminonaphthalene, formaldehyde by Das [19]. 8-hydroxyquinoline-5-sulphonic acid,