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SYNTHESIS, CHARACTERIZATION AND SEMICONDUCTING STUDIES OF2,4-DIHYDROXYBENZALDEHYDE-FORMALDEHYDE - ETHYLENE DIAMINE COPOLYMERS

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ABSTRACT
Copolymer(2,4-DHBEDF) was synthesized by the condensation of 2,4-Dihydroxybenzaldehyde [2,4-DHB] and ethylene diamine [ED] with formaldehyde [F] in presence of acid catalyst using varied molar ratios of reacting monomers. A copolymer composition has been determined on the basis of their elemental analysis and the number average molecular weight of this copolymer was determined by conductometric titration in non-aqueous medium. Viscosity measurement in Dimethyl sulphoxide have been carried outin order too ascertain the characteristic functions and constantsof 2, 4 DHBEDF copolymer resin. The newly synthesized copolymer resin was characterized by IR spectra and HNMR spectra. The electrical properties of (2, 4-DHBEDF copolymers were measured over a wide range of temperature (303-423 K). From electrical conductivity of these copolymers, the activation energies of electrical conduction have been evaluated and values lies in the range of13.24× 10-23 – 10.80× 10-23 J. The plots ofof log σ vs. 1/T has been found to be linear temperature range under study which indicates that the Wilsons exponential lawσ = σ0 exp(-Ea/ K)1/T is obeyed. On the basis of above studies, these copolymers can be ranked as semiconductors. When a voltage is applied to a thin film of this copolymer resin then it emitted light. This property of 2,4-DHBEDF copolymer resin may be used to make a semiconducting and electronic devices such as transistors, light emitting diodes, solar cells.

Keywords: Resin, Synthesis, Electrical conductivity.

I. INTRODUCTION
The copolymer resins showssemiconducting property. This type of discovery has led to emergency of not only new types of materials capable of replacing metals but also new concept to explain their high conductivity. In fact, the electrical conductivity and other properties such as thermo-conduction, photoconduction, luminescence etc. are in close connection with their physical and chemical structure. Semiconducting polymers have been the subject of study for many decades for day to day application product for example, uses in electrical sensors and electronic devices.[1]

Bakr et al studied the optical and electrical conductivity investigation of Fe3+-(acrylonitrile-butadiene-styrene) terpolymer complex system[2]. Gupta et al have measured the electrical conductivity of p-hydroxybenzaldehyde- adipic acid- ethylene glycol[3].Pancholi et al studied the electrical resistivity of 2-hydroxyacetophenone-thiourea-trioxane and these polymers ranked as semiconductors.Urade et al have studied the nature of resin derived from 2,6-Diaminopyridine and terphthalic acid[4].Kapse et al have studied semiconducting behavior of the terpolyligand derived from p-hydroxyacetophenone,quinhydrone and melamine[5].Masram et al studied the electrical conductivity of resin derived from salicylic acid,butylenesdiamines and formaldehyde[6].Gurnule et.al have reported semiconducting studies of 8-hydroxyquinoline-melamine/biuret-formaldehyde terpolymer resin[7,8]. Borkar et al. studied electrical and optical properties of conducting polymer[9.10]

The present study deals with the synthesis and characterization of like 2,4-dihydroxybenzaldehyde, ethylene diamine and formaldehyde [2,4-DHBEDF] terpolymer resin by spectral methods for the first time. The synthesized terpolymer was characterized by elemental analysis, UV-VIS, FT-IR,1H-NMR, intrinsic viscosity and number average molecular weight. The electrical conductivities of four 2,4-DHBEDFcopolymer resins are studied over wide range of temperature.

II. EXPERIMENTAL
The important chemicals like 2,4-dihydroxybenzaldehyde, adipamide and formaldehyde used in the preparation of various new 2,4-DHBAF terpolymer resins were procured from the market and were of chemically pure grade.

A. Synthesis of 2,4-DHBEDF Copolymer resin
The 2,4-DHBEDF-Iterpolymer resin was prepared by condensing 2,4-dihydroxybenzaldehyde(1.3812gm, 0.1mol), ethylene diamine(0.601gm, 0.1mol), formaldehyde(7.5ml, 0.2mol) in the mole ratio of 1:1:2 in the presence of 2MHCl as a catalyst at 122±2oC for 6h in an oil bath with occasional shaking to ensure through