

# Electrical Conductivity Study of Novel Organic Copolymer Resin Synthesized from 2-Hydroxy, 4-Methoxybenzophenone, 1, 5-Diaminonaphthalene and Formaldehyde

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**Abstract:** Copolymer 2-H, 4-MBP-1,5-DANF-IV has been synthesized from 2-hydroxy, 4-methoxybenzophenone, and 1,5-diaminonaphthalene with formaldehyde by polycondensation method in acidic medium with 4:2:7 molar ratios of reacting monomers. The copolymer has been characterized by elemental analysis, FT-IR and <sup>1</sup>H-NMR spectra. Electrical conductivity measurement has been carried out to ascertain the semiconducting nature of the copolymer resin. The electrical conductivity of the copolymer has been found to be  $4.23 \times 10^{-9}$  to  $9.36 \times 10^{-7} \text{ ohm}^{-1}\text{cm}^{-1}$  in the temperature range 313-428 K. The activation energy of electrical conduction has been found to be  $6.68 \times 10^{-20} \text{ J/K}$ . The plots of  $\log \sigma$  Vs  $10^3/T$  are found to be linear over a wide range of temperature, which obeyed the Wilson's exponential law  $\sigma = \sigma_0 \exp(\Delta E/KT)$  and the copolymer can be ranked as semiconductor

**Keywords:** Copolymer, Resin, Condensation, Synthesis, Electrical Conductivity Semiconductors

## I. INTRODUCTION

Polymer offers versatility and novelty hence they inhabit the main roll in semiconductor. The polymer scientists are trying to improve the properties of polymeric resins such as thermal stability, high chemical resistivity, durability, conductivity in the domain of desired applicability. Semiconducting polymers have been the subject of study for many decades for day to day application in modern electronics including antistatic coating, corrosion protection, in biosensors for coupling of electron transfer, fabrication of electrochemical windows, gas sensors, radio, computers, telephones, and many other electronic devices. Such devices include transistors, solar cells, the light-emitting diode, the silicon controlled rectifier, and digital and analog integrated circuits [1-4]. Chinchamatpure and coworker have reported the electrical conductivity of some copolymers and its polychalates [5]. Gabel et al. Have reported the synthesis, characterization and electrical conductivity of polyaniline  $\text{Mn}_{0.8}\text{Zn}_{0.2}\text{Fe}_2\text{O}_4$  nano-composites [6]. Gupta has studied the electrical conductance behaviour of terpolymer resin-II derived from p-hydroxybenzaldehyde, urea and ethylene glycol [7]. Electrical conductivity study of thermally stable newly synthesized terpolymer has reported by Niley and coworker [8]. Khedkar et al. [9] have studied the electrical conducting behaviour of newly synthesized m-cresol-hexamine-formaldehyde terpolymeric resin and its polychelates. Thakre [10] has synthesized the resins of 4-hydroxybenzoic acid, adipamide and formaldehyde and also studied the electrical conductance properties. Electrical conductivity measurement of salicylic acid hexamethylene-diamine- formaldehyde resin has studied by Masram et al. [11]. Electrical conductivity of salicylidene - anthranilic acid - schiff base formaldehyde resin (R-AASA) was reported by Abbas and coworker [12]. The present study deals with synthesis, characterization and semiconducting properties of a new 2-hydroxy, 4-methoxybenzophenon, 1,5-diaminonaphthalene and formaldehyde copolymer resin.