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# 3. Electrical Conducting Behavior of Copolymer Resin-III Synthesized from 2,4-Dihydroxypropiophenone, 4-Pyridylamine and Formaldehyde

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**Abstract**

The copolymer 2, 4-DHP-4-PAF-III has been synthesized by condensation of 2,4-dihydroxypropiophenone, 4-pyridyl amine with formaldehyde in acidic medium at $125 \pm 2^0$ C in 3:1:5 molar proportion of reactants. The structure of copolymer has been elucidated and confirmed on the basis of elemental analysis, UV-Visible, FT-IR, and $^1$H-NMR spectroscopy. The electrical conductivity of copolymer has been found to be in the range $1.97\times10^{-9} - 3.34\times10^{-7}$ $ohm^{-1}cm^{-1}$ in the temperature range 313-428 K. The activation energy of electrical conduction has been found to be $7.84\times10^{-20}$ J/K. The resin has been found to obeyed the Wilson's exponential law $\sigma = \sigma_0 \exp(-\Delta E/KT)$ and hence shows semiconducting behavior.

**Keywords:** Resin, synthesis, condensation, semiconductors, electrical conductivity.

## Introduction

The semiconducting properties of copolymer resins have gained sufficient grand in recent years. Electrically conducting copolymers are undoubtedly one of the focal points of current interest in solid state physics and chemistry. Their discovery has led to the emergency of not only new types of materials capable of replacing metals but also new concepts to explain their high conductivity. In fact, their conductivity and other properties such as thermo conduction, photoconduction, luminescence, etc. are in close connection with their physical and chemical structure [1]. Work on organic conducting polymers is carried out extensively due to their wide applications in areas such as, development of individual electronic, in biosensors for coupling of electron transfer, gas sensors and whole integrated circuits [2] etc.