

**STUDIES ON ELECTRICAL CONDUCTIVITIES OF
SOME DOPED POLYANILINES**

Ph.D DISSERTATION

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ABSTRACT

A modified conductive polyaniline (emeraldine salt form) has been prepared on a one pot synthesis reaction system. Polymerization was carried out in situ by using aniline hydrochloride with hydrogen peroxide (50% H₂O₂) as the oxidant in aqueous medium and at ambient temperature. A standard procedure was achieved to give a yield of 23% under conditions of 6 M HCl and aniline to oxidant ratio of (2:1). The electrical conductivity of polyaniline depends on the concentration of HCl doping agent. Its concentration of 6 M HCl shows the highest conductivity among the polyaniline doped with other concentrations of HCl. The electrical conductivity of polyaniline was enhanced when further doped with iodine, boric acid and hydrogen chloride gas in 1 M HCl solution. The electrical conductivities of doped polyanilines were in the range of semiconductor category, *i.e.*, 10^{-2} – 10^{-8} Ω^{-1} cm⁻¹. In terms of electrical conductivity the order was as follows: I₂ doped PANI > boric acid doped PANI > hydrogen chloride gas doped PANI > PANI. It was found that the electrical conductivity was the unique physical parameter when optimal conditions were employed. The conductive nature, structural nature and other significant properties of polyaniline were characterized by elemental analysis, UV, FTIR, XRD, TG-DTA and SEM. The emeraldine salt conductive type of polyaniline was well-defined by the UV spectra at λ_{max} , 320 nm and 620 nm. The SEM morphology revealed the grain agglomerated type of the conductive polyaniline form. The iodine doped polyaniline showed the highest conductivity of 2.72×10^{-2} Ω^{-1} cm⁻¹, a value 10 fold order than the conductive polyaniline.