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Impact of Dopants Like NSA and P-TS on Characteristics of Polymers Synthesized using APS as Oxidants

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Abstract:

Polypyrrole (Ppy) was synthesized using ammonium per sulfate APS. The ratio of monomer to oxidants was 1: 2.4 and polymerization was carried out at room temperature. The attempt was made to increase the electrical conductivity by using p-TS and (NSA) as dopants by adding 10% in weight of dopants to the weight of Ppy. Two probe method techniques was used to measure the electrical conductivity and was found to be in the range of 10^{-3} to 10^{-2} S/cm.

Keywords: Polypyrrole, structure, doping, p-TS, (NSA),

Introduction:

The conducting polymers have seen rapid growth from 1977 onwards. But substantial development was observed in this field since the year 2000 when Nobel Prize was awarded for this subject. More than 25 different applications of various conducting polymers such as Polyacetelene, Polypyrrole, Polyaniline, etc. have been demonstrated. These polymers can be synthesized by various methods like chemical, electrochemical, and radiations. They can be suitably doped to convert them into semiconductors.

When monomers join together to make a long chain, the material becomes polymer. An example of a naturally occurring macromolecule is insulin, a protein hormone that occurs in the pancreas. Starch, cellulose, and natural rubber are some examples of polymers available in nature, which are form by the formation of chains of a simple unit repeated several times.

The polymer has the most complex structure and it is necessary to prove it at four different levels. That is (i) Monomer level (ii) Molecular-level (iii) Supramolecular level and (iv) Bulk in order to determine the same, the widely used methods are described below:

(i) Optical Microscopy:

The "sizes" of crystals of polymers have been estimated to be of the order of a few hundred-angstrom units. In terms of the defect or para crystalline model, this distance might alternately be interpreted as an average dimension over which crystalline order persists.

(ii) Electron Microscopy:

The application of electron microscopy plays an important role in our understanding of polymer morphology, microstructure, and surface characteristics. Many physical properties of the polymer depend greatly on a structural arrangement, inter chain biding pattern in polymers. The physical properties of crystalline polymeric solids [1] are probably more sensitive to structure modification than other classes of the many semi-equilibrium states which are possible. The polymer has a whole range of orders from completely crystalline regions to completely amorphous regions.

(iii) IR Spectroscopy (Structural determination):

In the infrared study of polymers, it is desirable to determine the vibrational origins of absorption bands in the spectra. To do this it is necessary to study the characteristic group