International Journal of Scientific Research in Science and Technology
Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)
© 2021 | IJSRST | Volume 8 - Issue 1

Structural Characterisation of conducting PPy/Rhodamine- B dye Composites Synthesized By Simple Chemical Polymerization Method

M. N. Pawar[1], N. S. Dixit[1], S. G. Khobragade[2], M.S. Dixit[3]

[1]Department of Physics, G. S. Tompe Arts, Commerce and Science College, Chandur Bazar, Maharashtra, India.

[2]Department of chemistry, BrijlalBiyani Science College, Amravati, Maharashtra, India

[3]Department of Physics, Jagadamba Mahavidyalaya, Achalpur, Maharashtra, India

ABSTRACT

This research contribution deals with thesynthesis of modified polypyrrole by doping it withxanthene dyessuch as Rhodamine-Bat different concentrations by simple chemical oxidative polymerization method by using ammonium peroxydisulphate as an oxidant. The Monomer to oxidant ratio was taken as 1:1. The synthesized composite materials was characterised by FTIR spectral analysis. The characterisation studies reveal the interaction between polymer and incorporated dopant.

Keywords : Pyrrole, Ammonium Peroxydisulphate, Polypyrrole, Triply Distilled Water

I. INTRODUCTION

Electron-conductive polymers were first reported in 1971by Nobel winners Shirakawa and his co-workers who synthesized conducting polyacetylene and found that it had a considerably high conductivity relative to other organic compounds, $10^3 Scm^{-1}$[1–3]. Since 1971, various conducting polymers and their synthesis mechanisms have been studied actively by many researchers [4]. Conducting Polymer Composites are 21st century materials used to meet the demand of improved materials and possess a combination of several desirable properties. With time the research conducted on studying more properties and improving the manufacturing process of composite material has increased[5]. Hybrid materials, are of profound interest owing to their unexpected synergistically derived properties because they can present simultaneously both the properties of a dopant molecule besides the usual properties of polymer (an organic molecule) with better chemical, mechanical, and thermal stabilities and reproducibility[6]. In this present research work conducting polymer PPy/Rhodamine-B dye composite was synthesized throughchemical oxidative polymerization route by using ammonium peroxydisulphate as an oxidant at low temperature.The monomer to oxidant ratio was 1:1M.Further its structural characterization was carried out through FTIR analysis.

II. METHODS AND MATERIAL

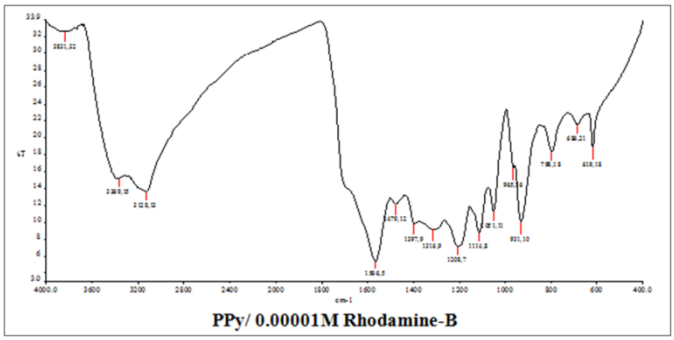
All the chemicals required in the present work like monomer pyrrole, oxidizing agent, ammonium peroxydisulphate and dopant Rhodamine-B are of A.R.Grade. PPy/Rhd-B dye composite was synthesized by simple chemical oxidative polymerization method.

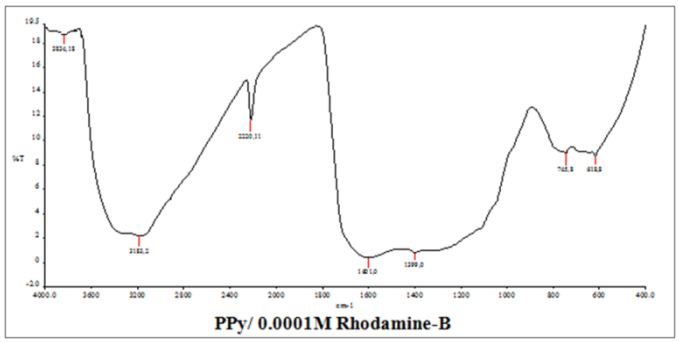
The aqueous solution of 0.1 M Ammonium peroxydisulphatewas added to 0.0001 M aqueous solution of Rhodamine-B with constant stirring. After a vigourous stirring at 50^0 C drop by drop 0.1 M solution of monomer pyrrole was added. It was observed that as soon as monomer solution was added the color of reaction mixture changes instantaneously and the solution becomes dark green/black in color. The reaction was carried out at 50C. The reaction was stirred for few hours on magnetic stirrer which gives rise to formation of precipitate of polymer composite. This reaction mixture was allowed tostand for 24 hours in order to complete polymerization process. The resulting product was vacuum filtered. The precipitate was washed with copious amount of triply distilled water. Until the washing was clear. The polymer composite was dried in desiccator and again dried in an oven at 40-50^0 C. similarly composite with 0.00001 M concentration of Rhd-B was also synthesized. The synthesized product was further characterized by FTIR Analysis.

III. RESULTS AND DISCUSSION

In order to find the nature of bonding in pyrrole and dopant Rhodamine-B was studied by FTIR spectrum of its composite materials.

The FTIR spectrum of PPy/ Rhodamine-Bis given in figure below-





The FTIR Spectra of PPy/Rhodamine-B composites with 0.0001 and 0.00001 M concentration of $LaCl_3$ shows six principle bands which are characteristic to represent N-H, Ar-C=C-H, C=C, C-N, C-C stretching vibrations and C=C-H bending vibrations The peaks below 1000 cm^{-1} in PPy/Rhodamine-B composites may be assigned to C-C-H bending vibrations. From these peaks it is revealed that the basic nature of polymeric material is same

Compared with higher concentration spectra peaks, the peaks of lower concentration spectral peaks are sharp. The reason behind FTIR peak is broadening is vibration may be restricted in presence of high dopant concentration. On increasing dopant concentration the intensities of most of the bands affected, this can be explained on the basis of constrained growth and restricted modes of vibrations in PPy chain due to interaction of dopant ions. A very broad peak near 3834.18 cm^{-1} and 3831.32 cm^{-1} indicates –COOH group of Rhd-B dye. The peak is broadened indicating to strong H-bonding. The very short peaks near 1316 cm^{-1} in both the spectrum indicates C-O bonding present in the dye. Most of the bands are shifted to lower frequency region indicates increase in conjugation after doping.

Table : Vibrational Frequencies of FTIR spectra For PPy/ Rhodamine B composite

Polymer Composite	Position of absorption maxima (cm^{-1})					
	N-H Stretching	Ar-H Stretching	C=C Stretching	C-C Stretching	C-N Stretching	C=C-H (Bending)

Pure PPy	3400	3120.42	1563.23	1206.27	1050.32	929.31
PPy/ 0.00001M Rhd-B	3369.15	3128.13	1566.5	1208	1051.11	931.10
PPy/ 0.00001M Rhd-B	3183.2 Broad	2220.11 Broad	1601.0 Broad	~1200.0 Broad	~ 900 Broad	745.8 Broad

IV.CONCLUSION

The PPy/Rhd-B dye composite were synthesized by chemical polymerization method. It is a simple and lowcost method for synthesis. The composite formation was confirmed by FTIR analysis. The IR study that the interaction exist between PPy and Rhd-B.The principle bands obtained IR spectrum of each composite confirms aromatic and highly conjugated polymeric structure. As theconcentration of dopant increases there is shift in bands at lower frequency region indicates increase in conjugation due to doping which affect the conducting properties of the polymers.

V. REFERENCES

[1]. B.C.Roy ,M.D.Gupta, L.Bhaumik, J.K.Ray, Bull.Mater.Sci., 24 (2001) 389.
[2]. Wessling B., Handbook of conducting Polymers (New York, Marcel Dekker Inc Press) P (1998)
[3]. J.Heeger, Angrew Chem. Int. Ed. Engl. 40, 2591 (2001).
[4]. J.Kido and Y.Lizumi, Appl. Phys.Lett. 73, 2721 (2002).
[5]. A.Shakoor, T.Z. RizwiA.Nawaz, Mater Sci : Mater Electron, 22 (2011) 1076.
[6]. J. Stejskal, Pure Appl. Chem., 74 (2002) 857.