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FLUOROSCENCE QUENCHING STUDIES OF BSA DOPED POLYANILINE

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Abstract — *Polyaniline (PANI) was synthesized by chemical oxidation polymerization method in the presence of ammonium persulfate as oxidant and benzene sulphonic acid (BSA) as dopant. In this study, fluorescence characteristics of polyaniline doped with BSA is soluble in Dimethyl sulfoxide (DMSO) in terms of fluorescence quenching reported in this paper. The synthesized BSA-PANI is characterized for its structural and morphological behaviour. The detection of quencher is studied through the observed intense quenching of fluorescence signals in the emission spectra of the BSA-PANI solution. The preparation of polymer solution is found to be 100 ppm in a 100 ppm solution of BSA-PANI solution.*

Keywords- *Polyaniline, fluorescence quenching, sulphonic acid dopant, X-ray diffraction. Scanning electron microscope.*

I. INTRODUCTION

Polyaniline (PANI) is one of the utmost promising conjugated conducting polymer which have fascinated more attention because of its economical low cost, superior electrochemical performance, mechanical flexibility and relative ease of processing [1-4]. Hence Polyaniline and its similarities find use in the field of sensors, actuators, super-capacitors, electromagnetic-shielding, corrosion protection, as well as electronic, electroluminescence and electro chromic devices [5-9]. Because of this prolonged conjugation inter-molecular hydrogen bonds are formed between the NH2 and NH-R group of the head-to-head chain and π stacking occurs. The polymer chain converts rigid which induces insolubility in most dynamic solvents. The processability of PANI can be enhanced by using functionalized dopants like Benzene sulfonic acid (BSA), Camphor sulfonic acid (CSA) or Dodecyl Benzene Sulphonic Acid (DBSA) etc. The bulky dopants will reduce the common aggregation by cumulative the solubility of PANI salt [10-13]. Polyaniline shows fluorescence characteristics due to the extended conjugation and were used as selective fluorescence for the detection of electron deficient nitroaromatics (NACS). Nitroaromatic are the prominent high energy materials which are being used as explosive materials and detonators etc.

The present studies are employed by doping PANI with BSA dissolving DMSO solvent before going for fluorescence studies. Fluorescence occurs when the molecule returns to the electronic ground state, from the excited singlet state, by emission of a photon. If a molecule which absorbs UV radiation does not fluoresce it means that it must have lost its energy some other way. The term quenching usually refers to non-radiative energy transfer from an excited species to other molecules. Meanwhile, fluorescence quenching is a process of decreasing in fluorescence intensity for a fluorescing species.

II. EXPERIMENTAL

2.1 Materials and Methods:

The BSA doped PANI is synthesised by chemical oxidation method employing ammonium per sulphate as the oxidising agent. The quencher and solvent DMSO were of analytical grade and were used as received.

2.2 Preparation of BSA- PANI:

0.2 M solution of BSA- PANI (0.5: 1) in DMSO are prepared to avoid self-absorption effects and the quencher concentration has been varied. A 100 ppm BSA-PANI in DMSO solution has been prepared by diluting the stock solution of 100 ppm. The 100 ppm quencher in DMSO is used. Below Figure 1. Shows Flow chart of the preparation of emeraldine base

2.3 Preparation of polymer films

The films of BSA doped polyaniline prepared by following procedure. 0.07grm sample of doped PANI was mixed with 0.02 gram of PVA in 10ml of DMF and the solution was stirred for 12 hrs. Then 0.16ml each of the various doped polyaniline solution was cost on a glass slide and dried in a vacuum over at 50-60□ C for 12 hrs.

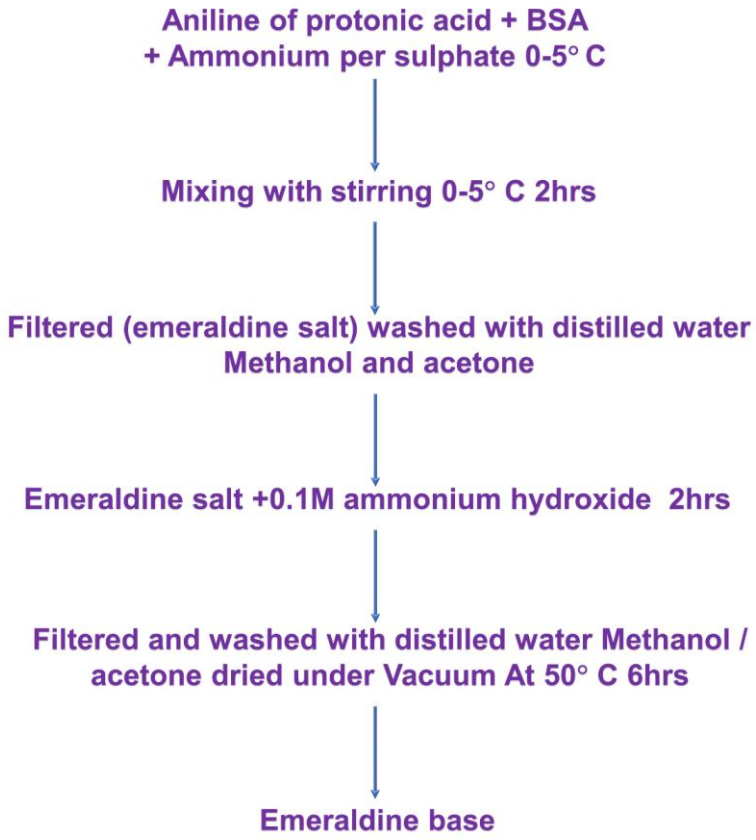

Figure 1. Flow chart of the preparation of emeraldine base

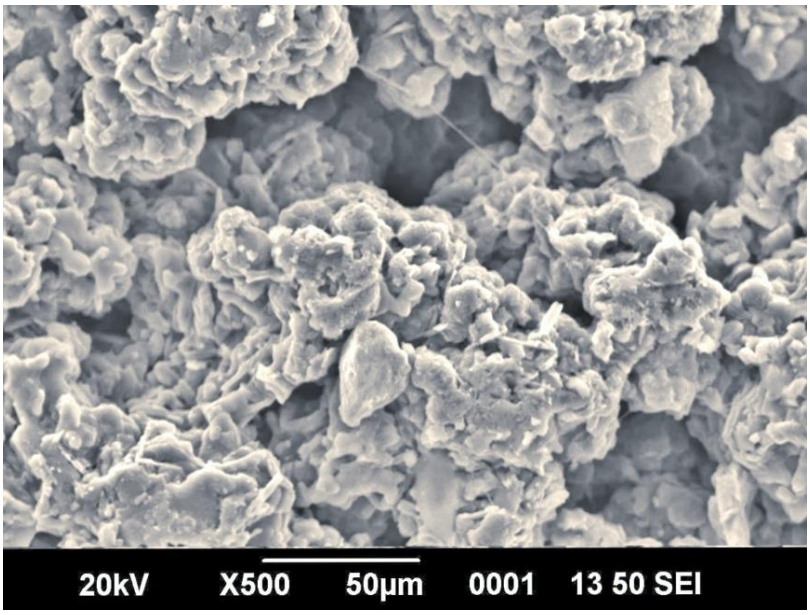

Figure 2. scanning electron microscope image of BSA doped PANI

Characterizations

Scanning Electron Microscope (SEM) The morphologies of the polymers were studied by using coupling JEOL Model JSM -6390LV scanning electron microscope. The electron microscope was operated at 20 kV. X-ray diffraction (XRD) Phillips-3710 powder X-ray diffractometer in the 2θ range10° to 100° using CuKα1 radiation (λ=1.54056 Å).

III. RESULTS AND DISCUSSION

3.1 Scanning Electron Microscope

BSA-PANI particles are shown in Fig. 2. It is observed clearly that the agglomerated spherical particles were formed when the feeding ratio of PANI-BSA was 1: 0.5 ratios the spherical and uneven arrangement of particles were observed.

3.2 X-ray diffraction

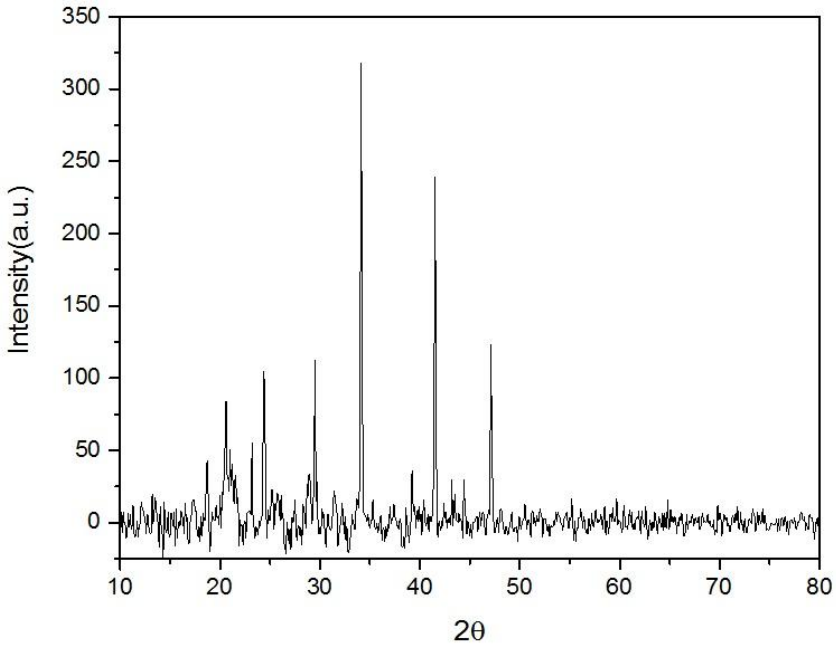

Figure 3. X-ray diffraction pattern of BSA doped PANI

XRD patterns of BSA-PANI-PVA, PANI is shown in Fig. 3. the crystalline peaks of BSA-PANI appeared at 2θ = 22.5°, 25°, 30°, 35°, 39°, 42° and 48° are accredited to the periodicity perpendicular to the BSA-PANI chain in its emeraldine salt form, representative that BSA doped PANI-PVA was partly crystalline (crystalline and amorphous). For the PANI/PVA, the frequent peaks at around 2θ = 20° were due to the P-PVA crystallites, and the diffraction peaks at about 2θ =25° were related to the partially crystalline PANI-PVA.

3.3 Fluorescence quenching studies

Figures 4 shows the fluorescence quenching of BSA-PANI with meta dinitro benzene (MDB). From the figure it is observed that the fluorescence intensity of the fluorophore reduced regularly with increasing concentration of quencher but no change in the emission wavelength of BSA-PANI is observed. This is due to quenching. The degree of quenching depends on the quantity of quencher in a homogeneous solution. This indicates that the non-radiative energy transfer between the excited donor (fluorophore) and the acceptor (quencher).

IV. CONCLUSIONS

BSA doped PANI-PVA thin films prepared and reveal that agglomerated uneven arrangement of particles shows in SEM partial crystallinity shows in XRD. Quenching studies of BSA-PANI reveal that the intensity decrease the electron are excited to ground state to exited state, a molecule in a high vibrational level of the exited state will quickly fall to the low vibrational level of the state by losing energy to other molecule through collision the term of quenching usually refers to non-radiative energy transfer from exited spices to other molecules

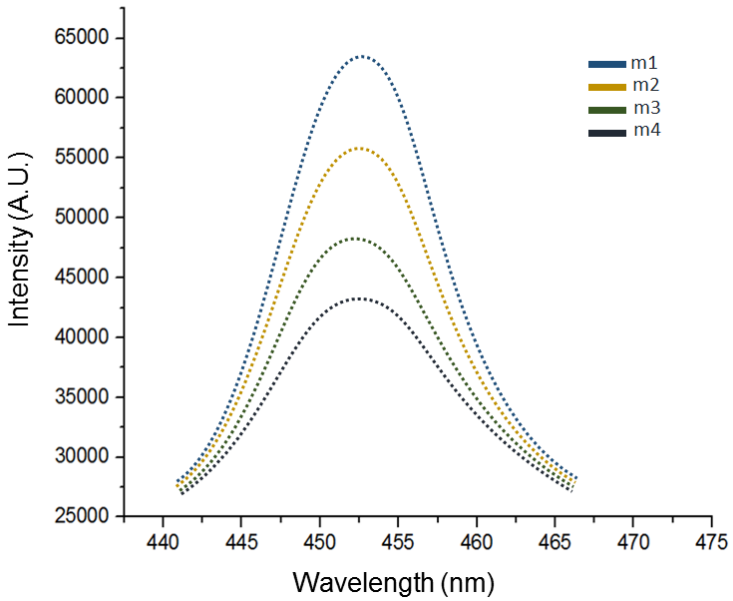

Figure 4: Fluorescence emission spectrum 100 ppm BSA-PANI with 100 ppm quencher

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