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Study on characterization and application of Polyaniline (PANI) and Fly ash composites.

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ABSTRACT

The aim of this study is to produce useful composite materials from fly ash, a major Waste product of coal combustion from power plants. The synthesis, characterization of polyaniline (PANI) and flyash composites gives wide area of applications. The electrochemical analysis of the composites showed that the composites were conductive. The SEM of the composites was studied by Scanning Electron Microscopy (SEM) and showed that our methods gave composites with improved homogeneity as compared to other reported methods.

KEY WORDS: Polyaniline, Fly-ash, Composites, Scanning Electron Microscope.

1. INTRODUCTION

To minimize these drawbacks, PANI is combined with Fly ash which enables the mechanical strength of to a desired level. But the addition of Fly ash does not change the other properties of PANI which will be discussed in this paper. The different proportion of PANI and Fly ash were prepared and subjected to SEM, XRD, FT-IR, UV-Spectroscopy, Tensile strength and four probe method. This paper

Mainly shows the result of FT-IR and Scanning Electron Microscope (SEM) which is desired to prove that the addition fly ash does not change much the morphology of PANI.

Experimental methods: The synthesis of PANI and FLY-ASH composites was prepared and it was taken for 50-50 ratio along with original sample. First its characteristic was studied under FT-IR Spectroscopy. The different samples of PANI-FLYASH are given below.

- Sample 1---fly ash (100%)
- Sample 2---polyaniline (100%)
- Sample 3---Polyaniline (50%)+fly ash (50%)

FT-IR Analysis: IR spectra of solids are usually complex with a large number of peaks, each corresponding to a particular vibration transition. A complex spectrum of all the peaks to specific vibration modes is possible with the molecular material. IR spectra are much used for the straight forward identification of specific functional groups present in the material especially in organic molecules.

$$T_w = \left[\frac{I_t}{I_o}\right] w \qquad (1)$$

Where I_t is the intensity of transmitted light, and I_o is the intensity of the incident light. The Beer-Lambert law provides a simple foundation for quantitating FTIR spectra by the relation

$$-\log T_\omega = \sum\nolimits_w bc \qquad (2)$$

IR spectra are mainly used for the straight forward identification of specific functional groups especially in organic molecules.

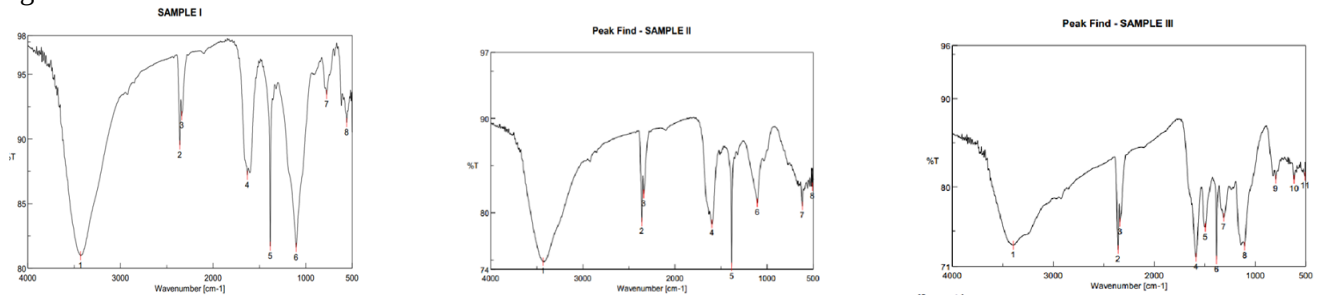

Figure.1. FT-IR analysis for three samples

The SEM images are displayed in the figures 2, 3 & 4 for three samples. The image of fly ash in figure 2 consists of numerous spherical particles with smooth texture. These particles could be oxides of silicon and calcium. SEM of PANI in figure 3 shows porous and non uniform surface. The PANI-FLYASH composites in figure 4 have the spherical structure are held between the porous surfaces of PANI. It clearly demonstrates the reinforcement of fly ash in the polymer network.

Scanning Electron Microscopy: SEM is observed that, as the PANI percentage increases, the connecting pathways become more and more dense and at in higher concentration, the morphology appears 'mist-like' photograph. This

SEM morphology reveals that the origin of high electrical conductivity and excellent optical quality also an improvement in connecting pathways enhances the charge transport and hence the conductivity.

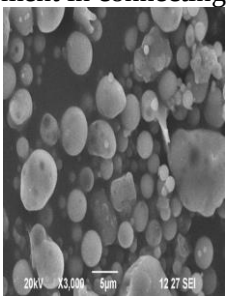

Figure.2. Sample A.

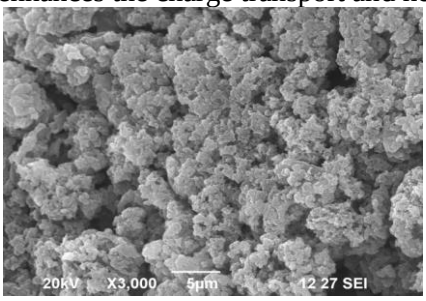

Figure.3. Sample B

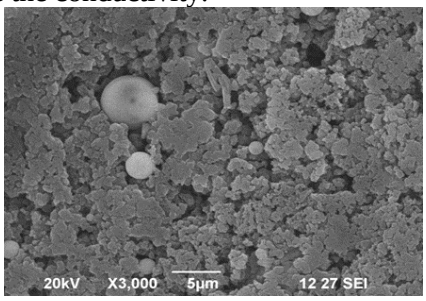

Figure.4. Sample C

3. RESULT AND DISCUSSION

Totally three number of samples were prepared subjected to FT-IR and SEM test.The FTIR spectra analysis of PANI-FLYASH composite is as shown in following fig 1. Samples 1 and 2 are the reverence value of FLYASH and POLYANILINE respectively. The remaining sample prepared by these composites and it was compared with the reference peaks. The FTIR analysis indicate that the blends retains the charge delocalization absorption and hence conductivity. FTIR studies reveal that the stretching vibration and oxide formation increase due to free NH groups and leads it to the conductivity of Polyaniline. Surprisingly sample 1 and 2 shows less that the significant change in spectroscopy of different materials. Sample 3 shows the primary absorption nearly at 3400.

4. CONCLUSION

The SEM morphology of fly ash reveals that when PANI doping percentage increases in Azopolyester, the connecting pathways become more and more dense, the morphology becomes 'mist-like' with increased PANI doping. This morphology is the origin of high electrical conductivity and excellent optical transmittance. An improvement in connecting pathways enhances the charge transport and hence there exist the conductivity and optical transmittance.

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