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Scanning Electron Microscopy Study of Polyaniline/Chromium Chloride Composites

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ABSTRACT

Polyaniline (PANI) and its composites are prepared by in situ synthesis using ammonium peroxidisulphate as an oxidant. The samples are characterized by scanning electron microscopy (SEM). Comparison of SEM images of PANI and PANI/$CrCl_3.6H_2O$ composites confirms the formation of composites. Also the bigger sized objects in the composites show the formation of clusters.

INTRODUCTION

Polyaniline (PANI) and its composites have steadily gained growing importance during the past decade. PANI, whose only electrically conductive form is the emeraldine salt, is the most attractive conducting polymer due to its low cost, high environmental, chemical and electrical stability at ambient conditions, good electrical conductivity and potential applications in molecular electronics [1, 2] and in field effect transistors [3]. Also it has attracted much attention due to its possible applications in electrochromic display devices, schottky diodes [4], sensors [5], optoelectronic devices, and electromagnetic shielding [6].

In this paper we report on synthesis and scanning electron microscopy characterization of PANI and its composites with chromium chloride. Though a good amount of work has been reported on the synthesis and characterization of PANI and its composites [3- 5, 7- 10]. But, till now to the best knowledge of author there is no report on synthesis and scanning electron microscopy study of polyaniline/chromium chloride composites.

EXPERIMENTAL DETAILS

Synthesis of PANI

To prepare PANI, 0.2 M aniline hydrochloride (Aldrich) was oxidized with 0.25 M ammonium persulphate (Aldrich) in aqueous medium. Both solutions were left to cool in the refrigerator for 2-3 hours and then mixed in a beaker drop-wise, maintained at a temperature between 0-4 ^{0}C in an ice bath, stirred for 2 hours and left for 24 hours at rest to polymerize in refrigerator. Thereafter PANI precipitate was collected on a filter paper and was washed with 1M HCl and subsequently with acetone till the filtrate turned colourless. PANI (emeraldine) hydrochloride powder was dried in air and then in vacuum at 45^{0}C. PANI prepared under these conditions was taken as standard sample.

Synthesis of PANI/Chromium Chloride composites

The samples of PANI/$CrCl_3.6H_2O$ composites were prepared by adding 5, 10, 20 and 40 weight percentage of 0.1 M Chromium choride (Aldrich) to 0.2 M aniline hydrochloride solution in distilled water before oxidizing with vigorous stirring for 2 hours. Following this procedure, four different PANI/$CrCl_3.6H_2O$ composites were prepared and named as CrCl5, CrCl10, CrCl20 and CrCl40 respectively.

RESULTS AND DISCUSSION

Scanning Electron Microscopy (SEM)

The SEM images of PANI and PANI/$CrCl_3.6H_2O$ composite (CrCl20) are shown in figure 1.

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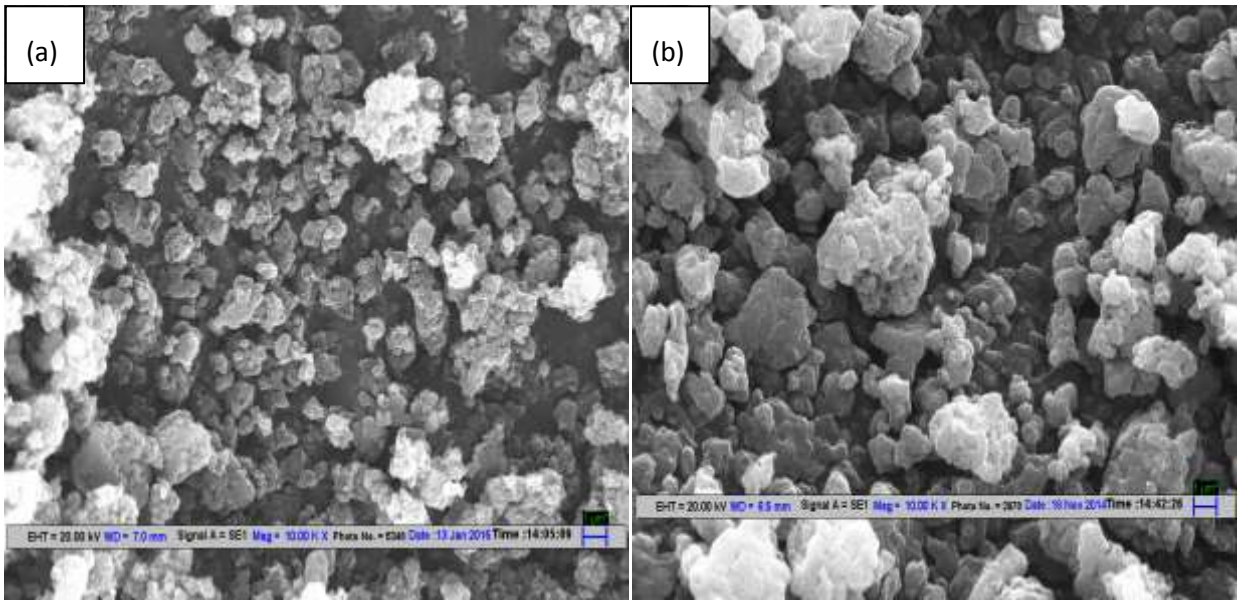

Figure 1: SEM of (a) PANI (b) PANI/ $CrCl_3.6H_2O$ composite (CrCl20)

Persual of the figure shows a difference in SEM images of PANI and PANI/$CrCl_3.6H_2O$ composites. This difference in the SEM images of PANI and PANI/$CrCl_3.6H_2O$ composites suggest the formation of composites. Also, some bigger sized objects are observed in PANI/$CrCl_3.6H_2O$ composites. These bigger sized objects suggest the formation of clusters. It shows that it is easy to control the composite structure by using various types and shapes of metal chlorides.

CONCLUSION

Polyaniline (PANI) and its composites were prepared by in situ synthesis using ammonium peroxidisulphate as an oxidant. The samples were characterized by scanning electron microscopy (SEM). Comparison of SEM images of PANI and PANI/$CrCl_3.6H_2O$ composites confirmed the formation of composites. Also the bigger sized objects in the composites showed the formation of clusters.

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