

Synthesis, Characterization and Thermal Analysis of Polyaniline/Co₃O₄ Composites

Z.-C. Tan^{1,2,C,S}, S.-X. Wang², Y.-S. Li² and L.-X. Sun¹

¹*Thermochemistry Laboratory, Dalian Institute of Chemical Physics, Chinese Academy of Science, Dalian, China*

²*College of Environmental Science & Engineering, Dalian Jiaotong University, Dalian, China
tzc@dicp.ac.cn*

Conducting polymer composites is some suitable composition of a conducting polymer with one or more inorganic nanoparticles so that their desirable properties are combined successfully. Over the last few years, conducting polymer composites have been studied with growing interest because of their numerous applications in various electrical and electronic devices [1-3]. The conducting polyaniline (PANI) is one of the promising conducting polymers due to its high conductivity, easy preparation, good environmental stability, and large variety of applications. Nowadays, the PANI has been successfully utilized in preparation of different composites, such as PANI/TiO₂, PANI/Fe₂O₃, and PANI/ZrO₂ [4-6]. However, to the best of our knowledge, no publications have been found in literature about the preparation and the properties of PANI/Co₃O₄ composites.

In the present work, conducting polyaniline/Cobaltosic oxide (PANI/Co₃O₄) composites were synthesized for the first time, by ‘in situ’ deposition technique in the presence of hydrochloric acid (HCl) as a dopant by adding the fine grade powder (an average particle size of approximately 80 nm) of Co₃O₄ into the polymerization reaction mixture of aniline. The composites obtained were characterized by infrared spectra (IR) and X-ray diffraction (XRD). The thermal stability and degradation behaviors of the composites were studied by thermal gravimetric analysis (TGA). TG curves and DTG curves of the composites suggest that the thermal degradation process of PANI/Co₃O₄ composites proceeds in two steps and the composites are more thermally stable than that of the pure PANI. The improvement in the thermal stability for the composites is attributed to the interaction between PANI and Co₃O₄, which restricts the thermal motion of PANI chains and shields the degradation of PANI in the composites.

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