GRAPHENEOXIDE AND CONDUCTING POLYMER COMPOSITES: SYNTHESIS AND INVESTIGATION

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Graphene and its derivatives have attracted significant attention due to their wide range of potential applications, particularly in electrochemical sensing. Graphene oxide (GO), obtained by graphite oxidation, exhibits good dispersibility and chemical functionality, making it suitable for composite materials [1]. Conductive polymer composites offer improved surface area, more recognition sites, reduced detection limits, lower electrical resistivity or faster response time, and enhanced stability. Their mechanical properties are also improved, resulting in more durable and robust sensors [2]. Despite increasing interest in GO based polymer composites, achieving materials with uniform structure and reliable functional performance remains a key challenge that this study aims to adress. The aim of this study was to synthesize GO and poly(aniline-anthranilic acid) copolymer composites (GO/PANI-AA) and to perform their structural characterization.

GO was synthesized using a modified Hummer‘s method with graphite as the starting material. Graphite oxidation was carried out using sulfuric acid, potassium persulfate and phosphorus (V) oxide. The resulting intermediate GO product was further oxidized by adding sodium nitrate and potassium permanganate. GO/PANI-AA composites were prepared in hydrochloric acid by dissolving GO, aniline (PANI), anthranilic acid (AA), and ammonium persulfate. The ratio of GO to (PANI + AA) was 1:1, while the ratio of PANI to AA in the composite was varied.

The results demonstrated that the incorporation of GO significantly influenced the structural, morphological, electrochemical properties of the PANI-AA copolymer. SEM analysis revealed a more homogeneous surface morphology of the composites compared to the pristine copolymer, indicating improved dispersion of GO within the polymer matrix. XPS and Raman spectroscopies results confirmed the successful formation of the composite. Electrochemical measurements revealed that the composite with an PANI to AA ratio of 25:75 exhibited the best electrochemical performance for electrode modification.

The results suggest that GO/PANI-AA composites can be effectively used for electrode modification in electrochemical applications. The identified optimal composition provides a basis for further development of conducting polymer composite materials.

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