Graphene oxide produced from different graphite sources for water purification

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In recent years, there has been an important problem of utilization and purification of wastewater from dyes, due to the huge emission from chemical, pharmaceutical, food and other industries [1]. Wastes are often removed together with other substances into sewage systems. However, they can get into the living organisms and cause of varying diseases. This problem can be solved by designing new sorbents and membrane filters based on carbon materials especially graphene oxide (GO).

GO based materials is of great interest due to its unique structure and properties and potential applications, including water purification [2]. In this study, a series of GO samples with different degrees of oxidation were produced from natural and synthetic graphite sources by varying the amount of $KMnO_4$ added. The samples of natural graphite with a high degree of crystallinity, and synthetic finely dispersed graphite with small layer thickness, having non-crystalline areas were used. All as-synthesized materials were characterized by CHNS analysis, XRD, FTIR and Raman spectroscopy, SEM and TEM.

It was revealed that the oxidation process for natural and synthetic graphite sources proceeds in different ways. The determining factors for the structure and properties of GO are the degree of crystallinity and the lateral size of graphite flakes. The sorption activity of underoxidized, normally oxidized and overoxidized GO was studied toward the methylene blue (MB) dye in aqueous solutions (Fig.1). The most efficient results were obtained for underoxidized and overoxidized GO produced from synthetic graphite. The sorbents removed 94% and 100% of MB from the solution, respectively, in approximately 10 minutes. Our results reveal that the structure and sorption properties of GO can be tuned by varying the oxidation degree as well as graphite source, which may open the way to new developments in the designing new membrane filters for water treatment.

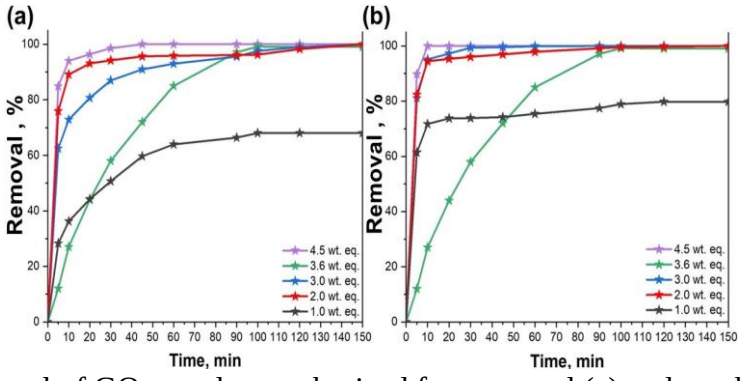

Figure 1. Removal of GO samples synthesized from natural (a) and synthetic (b) graphite sources

References

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