(وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ وَسَتُرَدُّونَ إِلَى عَالِمِ الْغَيْبِ وَالشَّهَادَةِ فَيُنَبِّئُكُمْ بِمَا كُنْتُمْ تَعْمَلُونَ)

صدق الله العظيم

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Dedication

This thesis work is dedicated to my lovely husband, Mahmoud, who has been a constant source of support and encouragement during the challenges of graduate school and life. I am truly thankful for having you in my life. This work is also dedicated to my parents who have always loved me unconditionally and whose good examples have taught me to work hard for the things that I aspire to achieve.

Abstract

Graphene is a carbon material with a two – dimensional (2D) sp^2 – hypridized carbon atoms in a honey camd lattice , and it is the bulding block for the graphite materials of all other dimension. Graphene has many applications owing to its chemical , mechanical and electronic properities.

The reduced graphene oxide material was prepared via the reduction of the graphite oxide by applying the environmental friendly methods using either green tea and / or ethanol as reducing agents.

The graphite oxide was prepared by the improved Hummer's method. The degree of graphite oxidation is systematically controlled according to the change in the oxidation time from (6 to 24hrs) , $KMnO_4$: graphite wt. ratio from (1:1 to 3:1) and in the presence of phosphoric acid. The prepared graphite oxide samples have been characterized by applying different techniques; XRD, FTIR, TGA, zeta potential, and TEM.

The graphite oxide sample that prepared through the oxidation process using 3:1 KMnO4: graphite ratio during 24hrs was selected to prepare the reduced graphene oxide samples.

The use of the green tea as reducing agent is studied by applying either refluxing, and/or sonicating technique.

In addition, the use of the extracted poly phenol green tea is also studied.

On the other hand, the solvothermal reduction method is carried out using ethanol as reducing agent under the experimental reaction conditions; temperature range 150-250°C, time 2-6hrs , and the amount of graphite oxide from 1-5 gm.

The reduced graphene oxide samples which can be obtained through the exfoliation- reduction of the prepared graphite oxide samples are investigated using XRD, FTIR, TGA, BET-surface area and TEM techniques. Moreover, the ethanol converted products are evaluated using gas chromatographic analysis .

Keywords*: graphite. graphite oxide, reduced graphene oxide, green tea, solvothermal method, ethanol, oxidation-reduction reaction.*

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