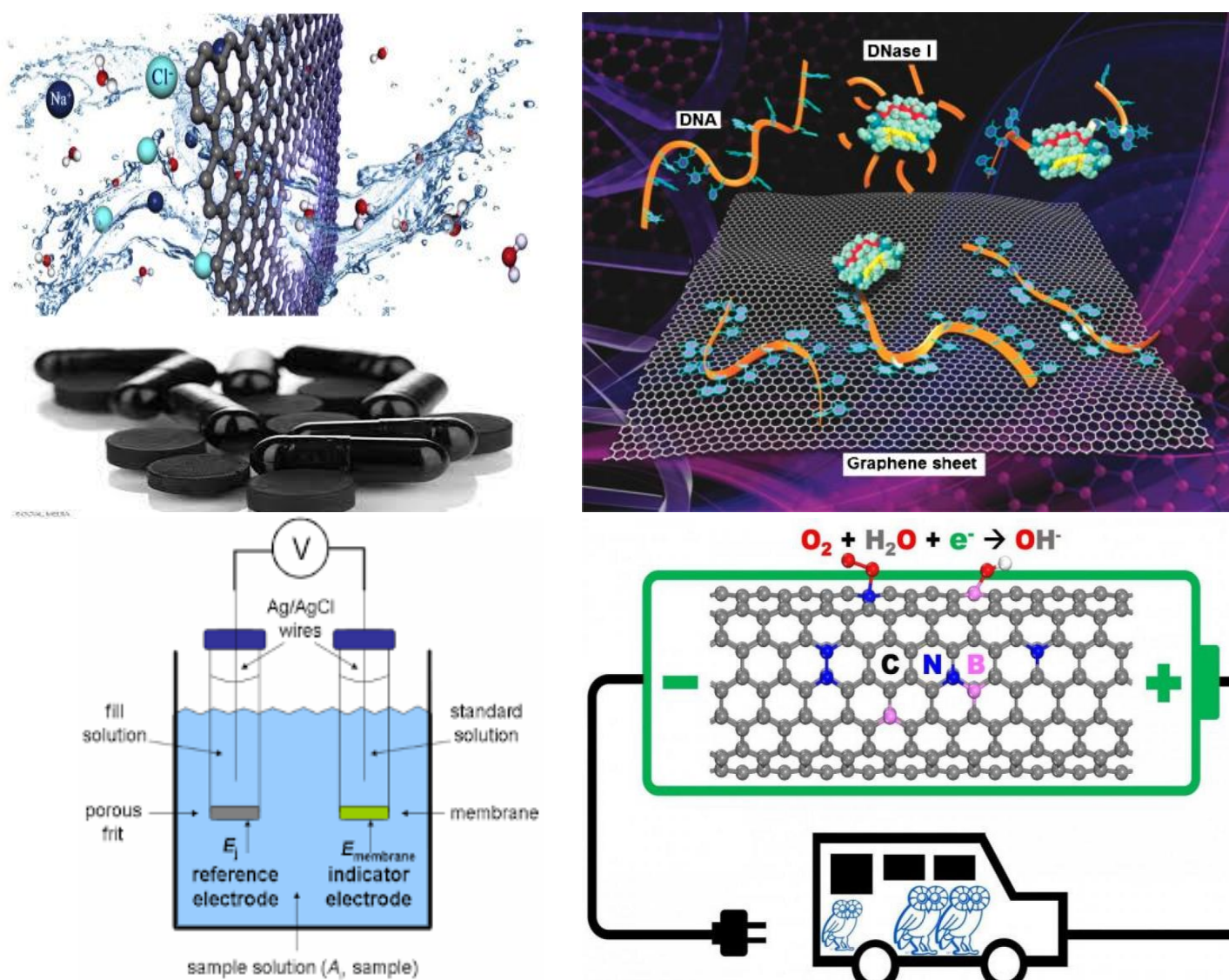


REDUCTION OF GRAPHENE OXIDE BY NEW CHEMICAL AND GREEN METHODS

INTRODUCTION

Nanoscience and nanotechnology preparation and manufacturing are accelerating due to the interim requirements and the global technical explosion in all sectors, and for this reason researchers and those interested in this field are competing to obtain new products to obtain high quality or a new product to meet the needs and requirements of modern development, SO Graphene and its oxide (GO) have a lot of attracted due to their interesting electronic properties[1] Graphene (Gr) is known as a substance an allotropic form of carbon consisting of 100% carbon, discovered experimentally in 2004 [2]. It is a material composed of a single layer of atoms arranged in hexagonal rings resembling a honeycomb [3]. It is characterized by high electronic conductivity, superior mechanical strength and flexibility, thermal conductivity, large electronic mobility and visible light penetration [4-5], and graphene is a two-dimensional material on two levels (2D) [6]. It has a pattern of hybridization in one layer, with unique characteristics as it is the only material that is on one layer, while the rest of the bodies are three-dimensional 3D [7-10]. Graphene also has special electrical properties with a high transferability of an electron at normal temperature. ($250,000 \text{ cm}^2 \text{ V}^{-1}$) [4,8]. Electrons can only move between carbon atoms in the two-dimensional lattice. [11] It has exceptional thermal conductivity and remarkable mechanical properties [12] (Young's modulus of 1 TeraPa and internal strength 130 GPa) [13]. Pure graphene appears in the form of a sheets, which gives it a porous character in addition to the presence of gamma electrons [14] Theoretically it has a very high specific surface area of $2600 \text{ m}^2/\text{g}$ [15-17]



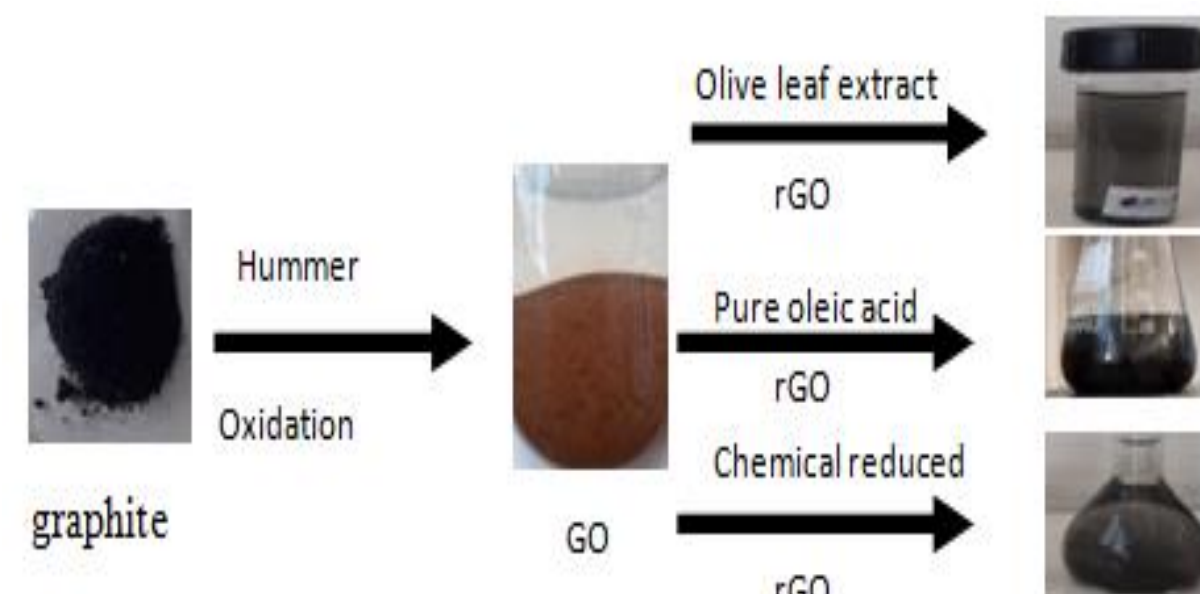
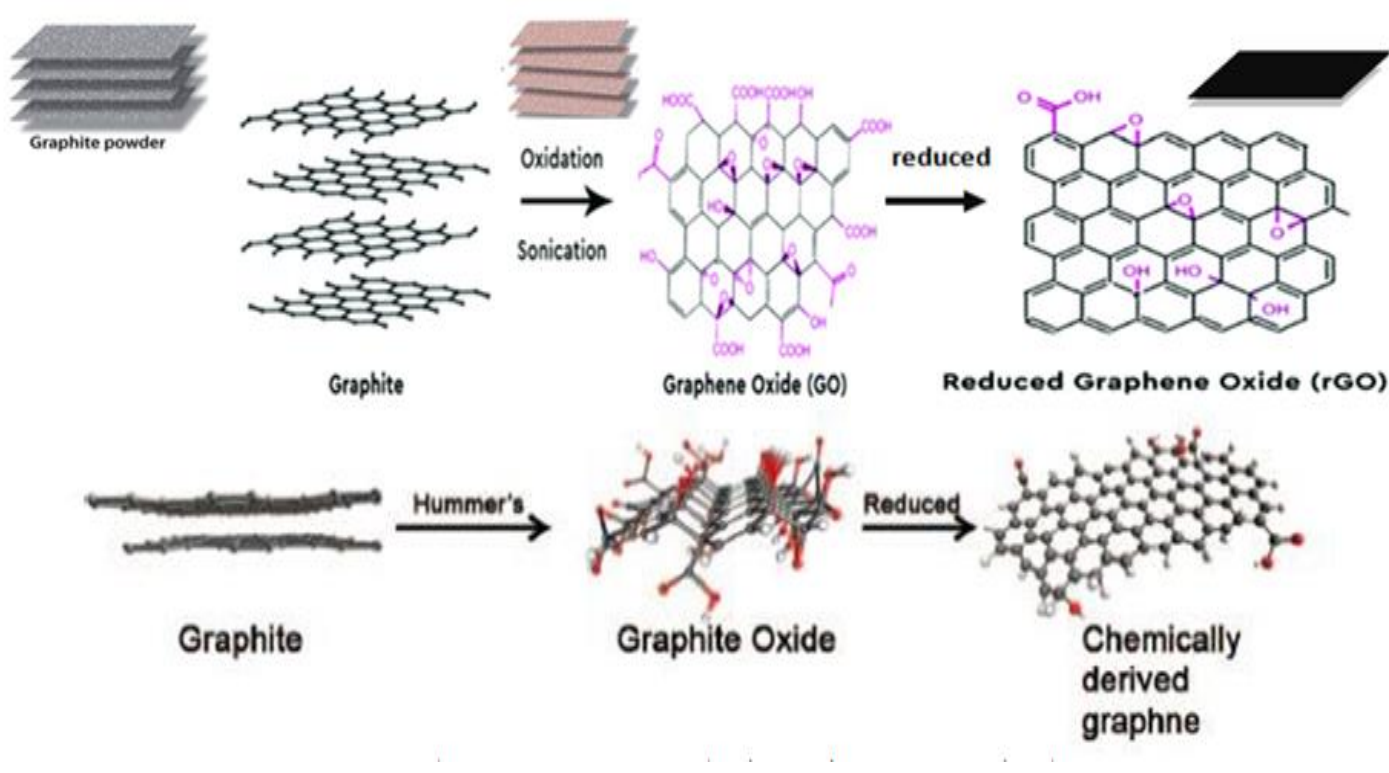
OBJECTIVES

This research aims to synthesize graphene oxide GO using Hammer's method. Then reduced the graphene oxide by three chemical and green methods to obtain the reduced graphene oxide rGO and compare between these methods.

MATERIALS & METHODS

The materials used in the research are high-purity materials, which are: 325mesh graphite powder (QuallKems), Olic acid made by MERK - Hydrochloric acid 37% (Shamlab) NaOCl 12% - Sodium Nitrate 96%(HIMEDIA) - Potassium Permanganate 99% (SiscoResearchLab)- Urea, Ammonium - Purity Sodium Hydroxy Sodium (SDFCL)- Sulfur Acid 98% (SHAM CHEMI)- Fertilizer – diluted double water - Local Olive Leaves, Spectrophotometric (SHEMADZU), And Infrared FTIR,

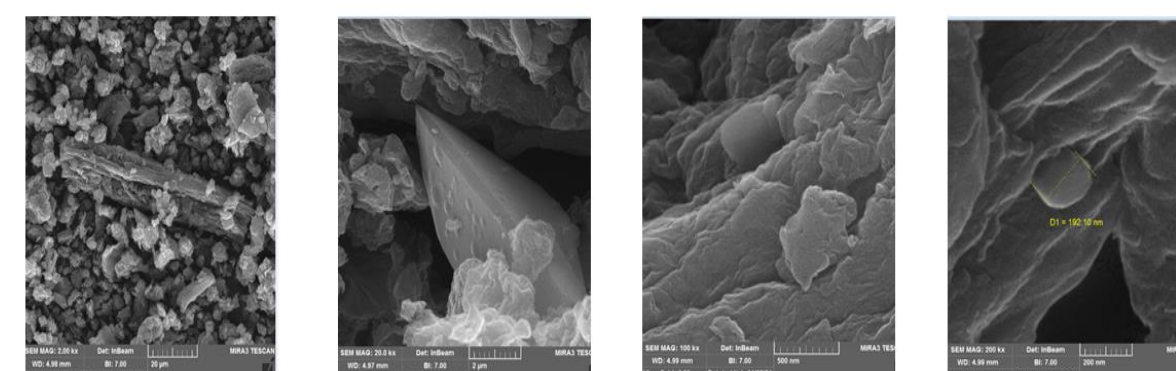
Place of the analyzes: FESEM scanner in Arya electro optic- Iran, Damascus - Syria SEM- EDX, FTIR spectrum in the Department of Chemistry - Faculty of Science - Tishreen University. UV-VIS Spectroscopy at the Higher Institute for Environmental Research, Tishreen University.



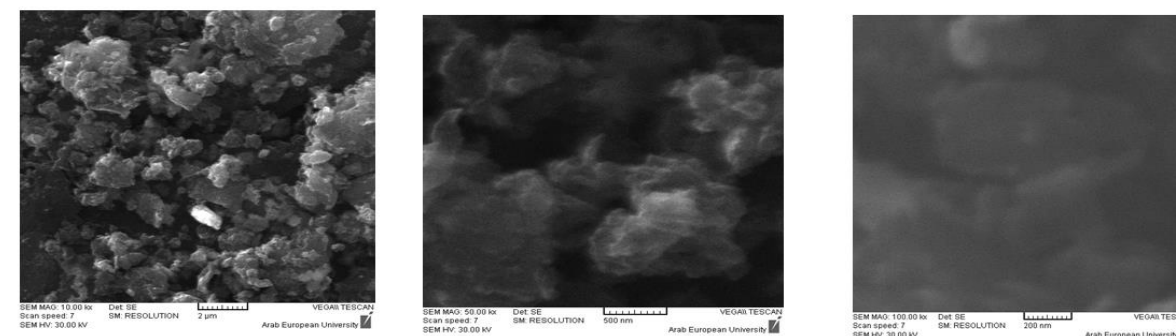
RESULTS

Graphene oxide can be reduced depend on three new methods:

- 1- olive leaf extract
- 2- oleic acid
- 3- chemical reduction



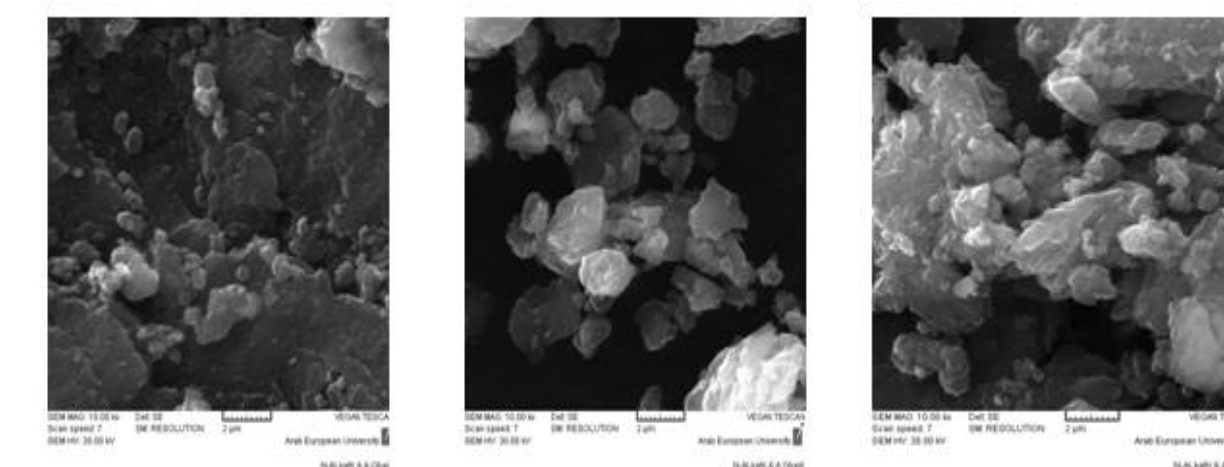
SEM for rGO using olive leaf extract



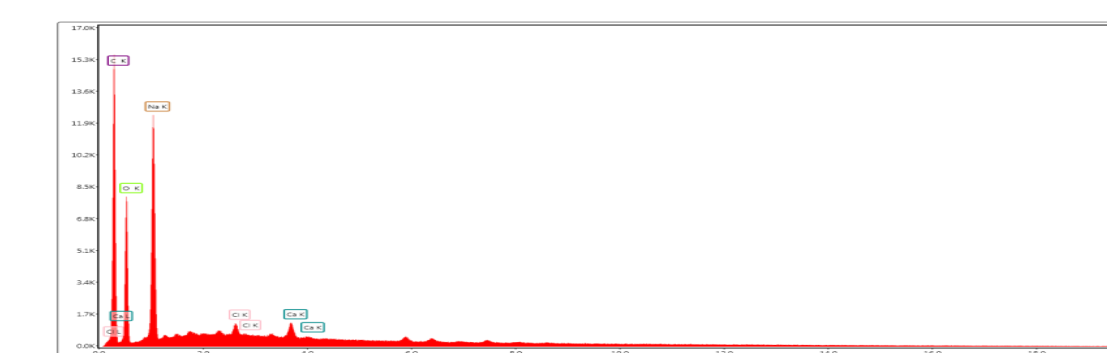
SEM of rGO based on pure oleic after



EDX spectrum of rGO based on pure oleic after a temperature of 440 °C at a rate of 2.3 °C/min



SEM of graphene oxide reduced based on chemical and then milled



EDX spectrum of graphene oxide on chemical and then milled

CONCLUSIONS

Graphene oxide can be reduced depend on three new methods, but the reduced mechanism is affected by several factors. Green chemistry methods are used to reduced it, as is the case when using olive leaf extract and oleic acid. Graphene oxide is reduced, which are methods, and it can also be reduced based on chemical reduction, where it has the advantage The purity is better than the green method, but from its disadvantages it is not environmentally friendly.

The expected dimensions of graphene oxide return for the local olive leaf extract are within (20 μm -200 nm), while depending on pure oleic (200 μm -500 nm) after exposure to a relatively high temperature and then grinding, Decrease in the radii of these sheets, and their radii ranged from (2 μ -200nm). In EDX measurement, the result showed that the percentage by weight of carbon was 72.04% and oxygen was 24.32%, while the reduction was by chemical method in the presence of hypochlorite and urea in an alkaline medium within (50 μm - 200 nm) and after grinding it obtained Decrease in the radii of these plates, and their radii ranged from (2 μ -300nm). In the EDX measurement, the result and weight percentage showed carbon 53.22% and oxygen 29.67%.

REFERENCES

- 1- Lai, Qi, et al. "Ultraviolet-visible spectroscopy of graphene oxides." *Aip Advances* 2.3 (2012): 032146.
- 2- Jaafar, E., et al. "Study on morphological, optical and electrical properties of graphene oxide (GO) and reduced graphene oxide (rGO)." *Materials Science Forum*. Vol. 917. Trans Tech Publications Ltd, 2018.
- 3- Swapna, M. S., and S. Sankararaman. "Investigation of graphene oxide in diesel soot." *J. Mater. Sci. Nanotechnol* 5.1 (2017): 104.
- 4-5- Baoun, Abeer, Hassan Kellawi, and AhamedFalah. "A modified electrode by a facile green preparation of reduced graphene oxide utilizing olive leaves extract." *Carbon letters* 24 (2017): 47-54.
- 6- Pei, Songfeng, and Hui-Ming Cheng. "The reduction of graphene oxide." *Carbon* 50.9 (2012): 3210-3228.
- 7- Bagher, Askari Mohammad. "Graphene and Graphene Quantum Dots Applications." Vol. 1, No. 2, 2016, pp. 84-92
- 8- Smith, Andrew T., et al. "Synthesis, properties, and applications of graphene oxide/reduced graphene oxide and their nanocomposites." *Nano Materials Science* 1.1 (2019): 31-47.
- 9- Casiraghi, Cinzia, et al. "Raman fingerprint of charged impurities in graphene." *Applied physics letters* 91.23 (2007): 233108.
- 10- Lee, Changgu, et al. "Measurement of the elastic properties and intrinsic strength of monolayer graphene." *science* 321.5887 (2008): 385-388.
- 11-Eluyemi, M. S., et al. "Synthesis and characterization of graphene oxide and reduced graphene oxide thin films deposited by spray pyrolysis method." *Graphene* 5.3 (2016): 143-154.

ACKNOWLEDGEMENTS

Department of Chemistry - Faculty of Science - Tishreen University.
the Higher Institute for Environmental Research, Tishreen University.

