

Ultrasonic waves effects on graphene structure fabricated by electrochemical exfoliation method

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Graphene, the magical matter of the last century, has attracted much attention. There are many methods for fabrication graphene sheets, but Amongst all investigated methods, electrochemical exfoliation method was chosen, because it does not have a lot of disadvantages of another method. Fabricate of high-quality graphene is a great challenge because graphene sheets are extremely affected by external factors. Cognition of external factors plays an important role in the manufacturing process of graphene sheets. Hence identification of these factors to the manufacturing of high-quality graphene sheets is so important. Because of this, we select and investigate ultrasonic waves as an external factor in this research. To fabricate grapheme sheets, we used exfoliation electrochemical method. To show how to be affected by ultrasonic waves we fabricated three samples (S0, S5, S10) we used applying ultrasonic waves to 0, 5 and 10 minute for homogenize the electrolyte. We studied the three fabricated samples using Fourier transform infrared spectroscopy (FTIR), Ultraviolet-visible (UV-VIS), X-Ray diffraction (XRD), Energy-dispersive X-ray spectroscopy and Scanning electron microscope (EDX and SEM). As a result, we found applying ultrasonic waves to homogenize the electrolyte during the fabrication process plays an important role to decrease oxygen groups rate in graphene. Generally, the research results show that the ultrasonic waves have a positive effect on the characteristics of graphene sheets (reduction in the oxygen groups) and negative effect in some cases (reduction in the size of graphene sheets).

References

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Figures

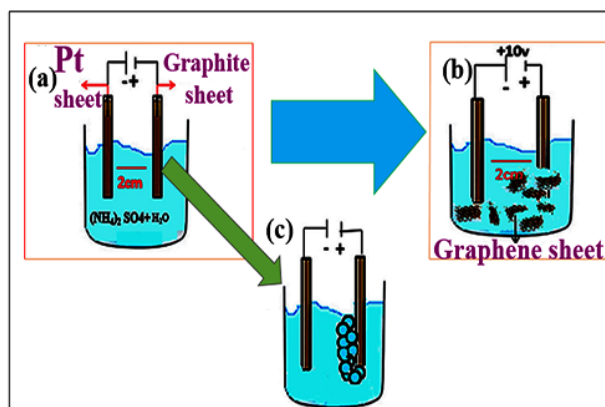


Figure 1 (a) Experimental setup. (b) Formation of bubbles on the graphite electrode. (c) Exfoliation of graphene from a graphite anode.

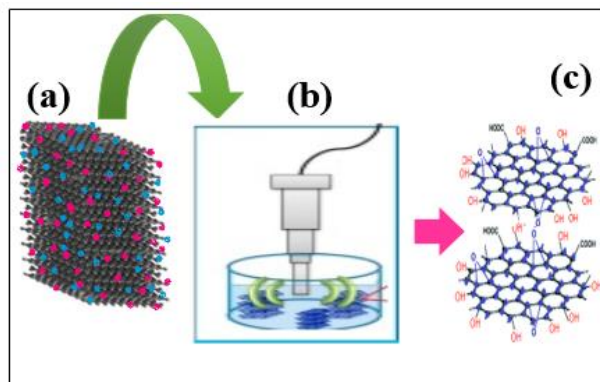


Figure 2 (a) Graphene sheet structure. (b) Ultrasonic waves effect on the graphene sheet. (c) Graphene sheets.

