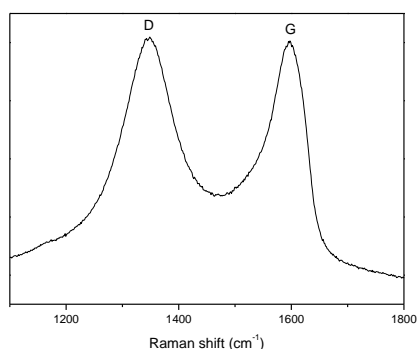


## An Environmental Approach of Reducing of Graphene Oxide

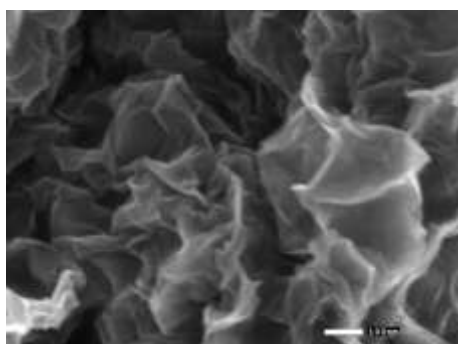
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Preferred mode of presentation: Oral

Solution-processable graphene is usually prepared from deoxygenation of graphene oxide by hydrazine reducing agent. However, the usage of this reducing agent is unfavorable for large scale graphene production as it is extremely harmful to human life and the environment. A lot of scientific approaches have been designed for green synthesis of graphene, such as vitamin C and melatonin. Here, we report the application of  $\beta$ -carotene as reducing agent for graphene oxide deoxygenation.  $\beta$ -carotene is a strong antioxidant that can be found abundantly in fruits and vegetables. In this work,  $\beta$ -carotene was extracted from palm oil mill effluent (POME), an industrial waste from palm oil industry. Deoxygenation of graphene oxide was confirmed by bathochromic shifting in UV spectroscopy and ATR-FTIR spectroscopy. Graphene formation was further confirmed with Raman spectroscopy with the increase in D/G band intensity ratio (Figure 1).



**Figure 1.** Raman spectrum of graphene reduced by  $\beta$ -carotene.



**Figure 2.** SEM image of graphene reduced by  $\beta$ -carotene.

The synthesized graphene remains its exfoliation condition as observed under SEM (Figure 2). Graphene paper-like membrane was formed thru filtering of graphene suspension thru ANODISC membrane and its conductivity and electrochemical properties were studied. In conclusion,  $\beta$ -carotene as reducing agent yields the quality of graphene comparable to hydrazine and vitamin C as reducing agents. It is an effective and environmental green approach to reduce graphene oxide with reducing agent extracted from industrial waste.

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