Synthesis and characterization of 2D nanocarbon synthesized by microwave irradiation

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Advancements in the field of nanoscience have opened the doors to variety of carbon nanomaterials (CNMs) such as carbon nanotubes, carbon nanopetals, carbon nanofibers, graphene, etc. [1,2]. These CNMs exhibit unique properties such as large surface area, high electronic conductivity, good thermal, chemical and electrochemical stabilities, etc. Hence they are widely used in advanced applications such as structural, biomedical, electronic, etc.

In the present study, 2D graphitic nanocarbon is synthesized by microwave irradiation technique from natural flake graphite (NFG) precursor. Potassium permanganate- perchloric acid- sulphuric acid based graphite intercalation system was used and 2D graphitic nanocarbon sheets are prepared by microwave irradiation.

Figure 1a shows the SEM image of NFG, which indicates the morphology of NFG is flat and flake-like. The flake-like morphology is appropriate to accommodate oxidant molecules within the layers of graphitic carbon sheets during the intercalation process. After the microwave irradiation, NFG is exfoliated in the direction of *c*-axis.

Figure 1b shows the SEM image of 2D nanocarbon, which indicates that the exfoliation process has enabled the expansion throughout the NFG. The thickness of individual 2D nanocarbon sheet is ~100 nm.

The 2D nanocarbon is characterized by Fourier transform infrared (FTIR) spectroscopy and the corresponding spectra is shown in Figure 1c. In the FTIR spectra, the peaks at 1622, 2924, 2854, 1246, 1127, 1040, and 972 cm^{-1} are correspond to O-H stretching, C-H stretching of alkyl chain, C-OH stretching, and C-O stretching, respectively [2].

Figure 1: (a-b) SEM images of (a) NFG and (b) 2D nanocarbon; and (c) FTIR spectra of 2D nanocarbon

References

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