

National Mission on Himalayan Studies

PERFORMA FOR THE HALF YEARLY PROGRESS REPORT

On

“Environmentally Sustainable Smart Synthesis of Carbon Nanomaterial Along With the Production of High Value Added Fuel and Additives for the Concrete Mixture from WASTE PLASTIC, a Hazardous Waste around the Himalayan Region”

(Period from 01-04-2016 to 30-09-2016)

Supporting data

By

Dr. N. G. Sahoo
Nanoscience and Nanotechnology Centre
Department of Chemistry
DSB Campus
Kumaun University, Nainital

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Introduction:

The plastic waste management has become a worldwide problem due to its non-biodegradable nature. The non-biodegradable nature of the plastic waste has created challenge in front of scientific community. Various attempts have been made in order to confront it. Thus this project is a sincere effort to eliminate all the problems caused by plastics by using mercantile law. Fortunately the high carbon content present in plastic waste gives us an opportunity to synthesize and produce cost-effective, environmentally-friendly, and self-sustaining CNMs, High value added fuel and additives for the concrete mixture to increase the quality of concrete, which may later be exploited for many other applications ranging from energy conversion and storage, biomedical applications such as drug discovery and delivery and many more. The preliminary work done as of now has been summarized as follows.

Preliminary work & Laboratory exercise:

An innovative method has been adopted for the synthesis of the graphene and graphene oxide (Figure 1). The precursor for this synthesis was waste plastic. The short description of the process has been summarized as follows.

Plastic as precursor

While the second approach was conceptualize keeping waste management in mind. For this plastic waste was collected, cleaned and chopped finely. The chopped material was heated at very high temperature till its degradation. The collected charred residue later on treated with OMMT, giving rise to the charred residue (Impure Graphene). The charred residue later on treated with the HNO_3 and the final product was analyzed for further characterization techniques.

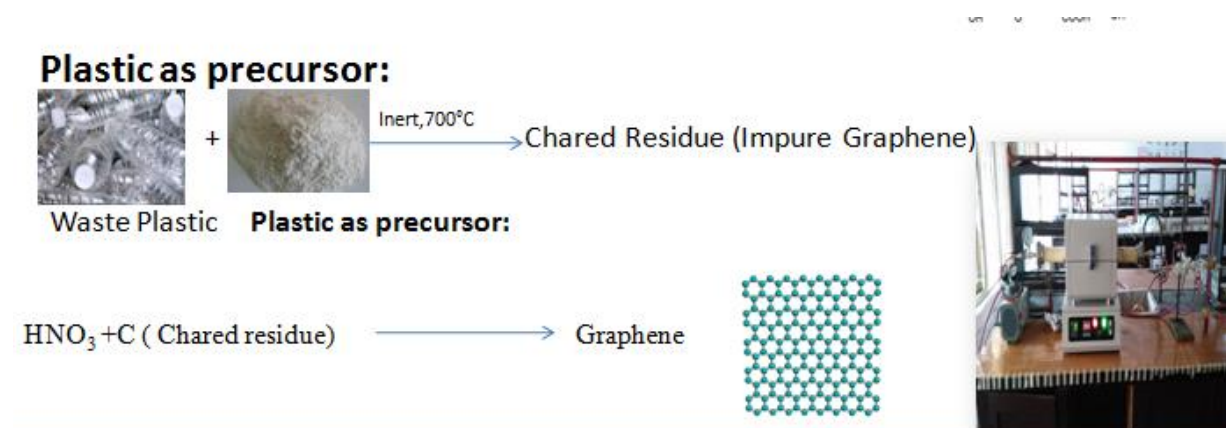
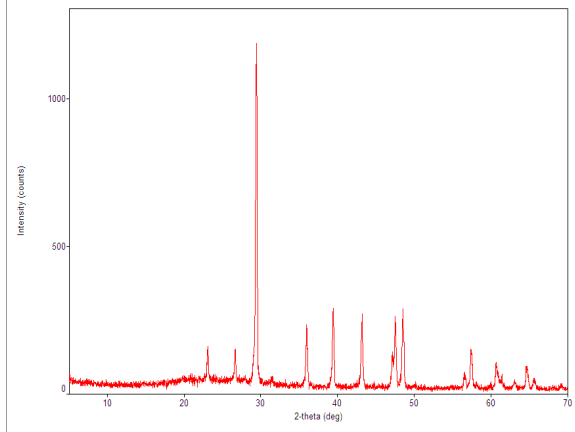
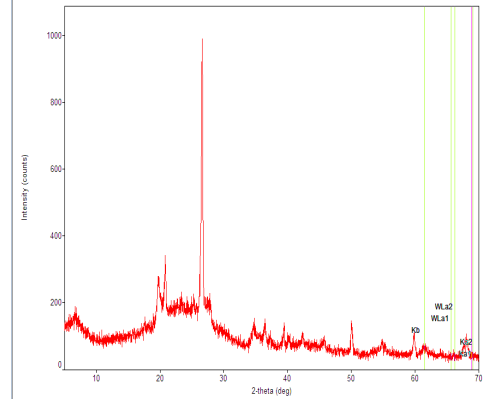


Fig. 1 Depiction of synthesis of graphene from the waste plastic

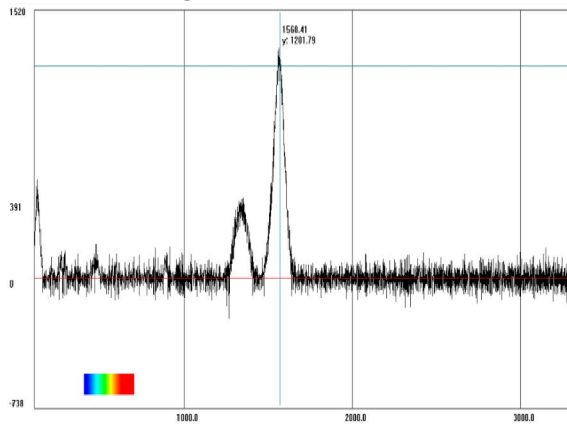
Characterization of the Graphene: The end product was confirmed as graphene. All the requisite data for the structural elucidation has been tabulated as follows.



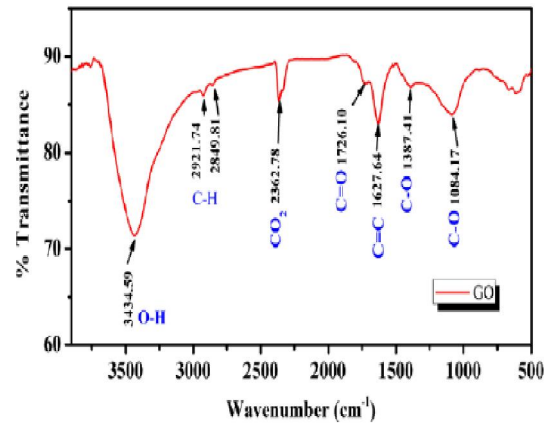
A. XRD spectra of charred residue (without washing)



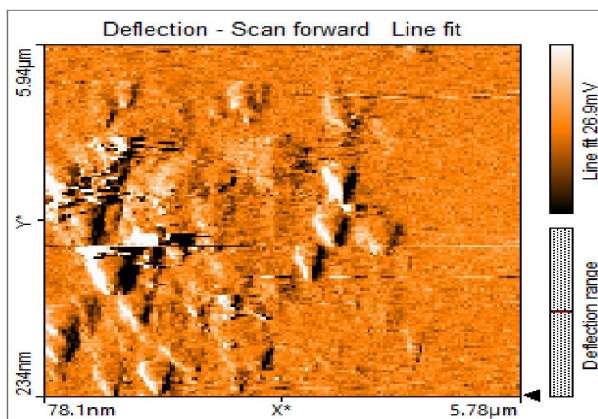
B. XRD Spectra of charred residue after washing



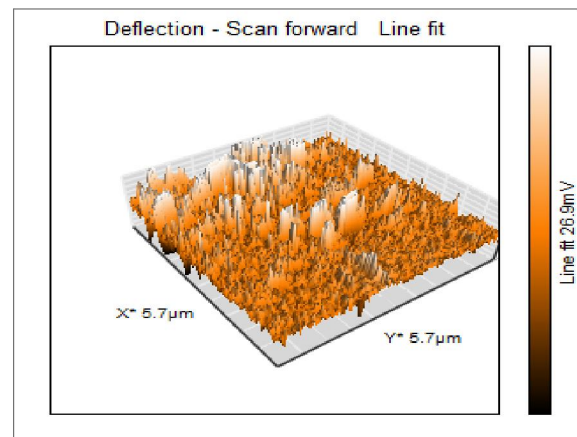
C. Raman spectra of charred residue



D. FT-IR Spectra of charred residue after washing



E. AFM Image of charred residue



F. AFM Image of charred residue

Conclusion:

Staff appointment

After getting the project most of the tedious task has been successfully done. Process for the selection of project staff was initiated immediately. Eligible candidates were appointed as JRFs after due process of advertisement and interview on 11-05-2016

Purchase of the instruments

Tender process was initiated for the purchase of instruments, and purchase orders were given to eligible parties after the consent of purchasing committee. Designing of the SWAYAMBHU WRM 2011

Discussions were carried for the successful designing, working and efficacy of the SWAYAMBHU-WRM-2021. This led us to finalize design and productivity of SWAYAMBHU-WRM-2021 with B.S. engineering and soon the plant will be installed at the working site

Experimental

It is clear from the results that we have successfully prepared graphene from the waste plastic at laboratory scale. Production at the large scale will be our utmost priority once the SWAYAMBHU -WRM -2021 gets installed at the centre.

Social Awareness Programs

Discussion with the involved NGO on the theme and nature of programs has been discussed and finalized. We are aiming to cover the whole Kumaun region in month of December regarding the awareness program.

Academic excellence

After the literature review one review paper has been submitted for the publication. In addition to this laboratory work has been presented in number of Internationals and National conferences. The details of these presentations have been summarized as follows. In addition to this one process patent has been filed at Indian Patent Office for the approval.

A. Patent Detail

1. N.G.Sahoo, Sandeep, M.Karakoti, V.D.Punetha, “A process of manufacturing Graphene”, Application No. 201611016081.

B. Review Paper

1. Sandeep, Manoj Karakoti, Sunil Dhali, Neema Pandey, Vinay Deep Punetha and Nanda Gopal Sahoo.; “*Invincible Applications of Conductive Organic Materials for the Development of Futuristic Solar Photovoltaics*”; J. Chem. Eng. Chem. Res. Vol. 3, No. 10, 2016,; Published: October 25, 2016.

C. National and International Conferences

1. Sandeep, Manoj Karakoti, Vinay Deep Punetha, Nanda Gopal Sahoo .; “A novel green synthesis of 2-dimensional carbon nanomaterial from waste plastic”; 19th International conference of International academy of physical science (CONIAPS XIX) & Symposium on Fixed point theory and dynamical systems.
2. Nanda Gopal Sahoo, Synthesis and functionalization of graphene oxide for drug delivery applications; 4th IWCCMP-2016, ABV-IIITM, Gwalior.
3. Sandeep, Manoj Karakoti, Vinay Deep Punetha, Nanda Gopal Sahoo “Environmental Sustainable Smart Synthesis of 2-D Carbon nanomaterials Along with the Production of High Value Added Fuel, Additives for Concrete Mixture from Waste Plastic”. India International Science Festival 2016. NPL Delhi.
4. Manoj Karakoti, Sandeep, Nanda Gopal Sahoo* Synthesis Of Graphene From Waste Plastic. ICMAMN-2016F. M. University, Balesore, Odisha, India.
5. Sunil Dhali, Vinay Deep Punetha, S.P.S. Mehta, Nanda Gopal Sahoo* Synthesis of Graphene and Carbon Nanotubes Hybrid for Fuel Cell Applications. 4th IWCCMP-2016, ABV-IIITM, Gwalior.
6. Neha, Himani Tiwari, Vinay Deep Punetha, and Nanda Gopal Sahoo* Graphene oxide as a nano carrier for drug delivery application. ICMAMN-2016F. M. University, Balesore, Odisha, India.
7. Sandeep, Manoj Karakoti, Vinay Deep Punetha, Nanda Gopal Sahoo*. Synthesis Of 2-D Nanomaterials For Energy Applications. 4th IWCCMP-2016, ABV-IIITM, Gwalior.

Award and Honor:

1. Best Research Paper Poster award to Mr. Sandeep, for presenting his research work “Synthesis Of 2-D Nanomaterials For Energy Applications”. In 4th IWCCMP-2016 at ABV-IITM, Gwalior.
2. Dr. Nanda Gopal Sahoo, Invited Speaker, Synthesis and functionalization of graphene oxide for drug delivery applications; 4th IWCCMP-2016, ABV-IITM, Gwalior.