A METHOD FOR THE PREPARATION OF IMMOBILIZED GRAPHENE-BASED COMPOSITE FROM ASPHALT

IITM Technology Available for Licensing

Problem Statement

- Graphene has great potential in water purification business due to its unique physical and chemical properties including high surface area.
- However, the use of graphenic materials for applications such as water purification is limited mainly due to the difficulty in large-scale synthesis and post treatment-handling.
- Moreover, the preparation of Reduced Graphene Oxide (RGO) involves the use of hazardous chemicals and produces undesirable hazardous products.
- There is a need for a simple, affordable and eco-friendly adsorbent for water purification produced using a simple synthetic route that avoids laborious steps including post-synthesis cleaning.

Intellectual Property

- IITM IDF Ref. **881**
- **IN 393415 Patent Granted**

TRL (Technology Readiness Level)

TRL 4 Technology Validated in Lab

Technology Category/ Market

Category- Environmental Engineering
Industry Classification:

- **NIC (2008)- 36000** Water collection, treatment and supply**; 28195-** Manufacture of filtering and purifying machinery or apparatus for liquids and gases; **37003-** Treatment of waste water or sewer by means of physical, chemical or biological processes; **23994-** Manufacture of graphite products other than electrical articles

Applications- Water treatment, water purification

Market drivers:
The global graphene market size is projected to grow from $ 570.3 million in 2024 to $ 5,193.2 million by 2032 exhibiting a CAGR of 31.8% during the forecast period

Research Lab

Prof. Pradeep T
Dept of Chemistry, IITM

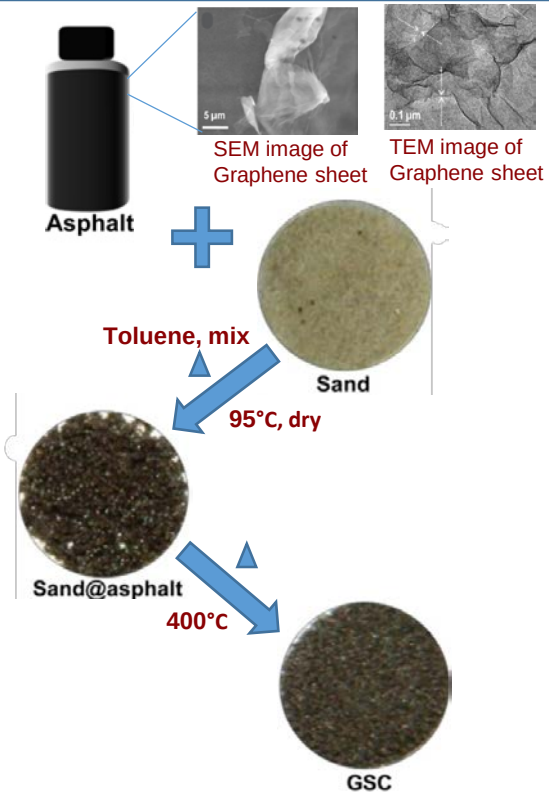


Figure: Schematic illustration of Graphene Sand Composite (GSC).

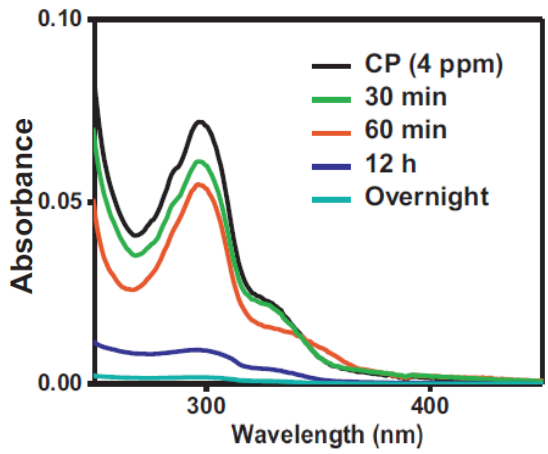


Figure: UV-/vis spectrum shows adsorption of chlorpyrifos (CP)-an organo-phosphorus pesticide, by the GSC adsorbent. About 250 mg of GSC (0.5 wt%) removes 4 ppm of CP (10 mL) completely.

CONTACT US
Dr. Dara Ajay, Head TTO
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719

IIT MADRAS
Indian Institute of Technology Madras

Technology Transfer Office
TTO – IPM Cell

Industrial Consultancy & Sponsored Research (IC&SR)

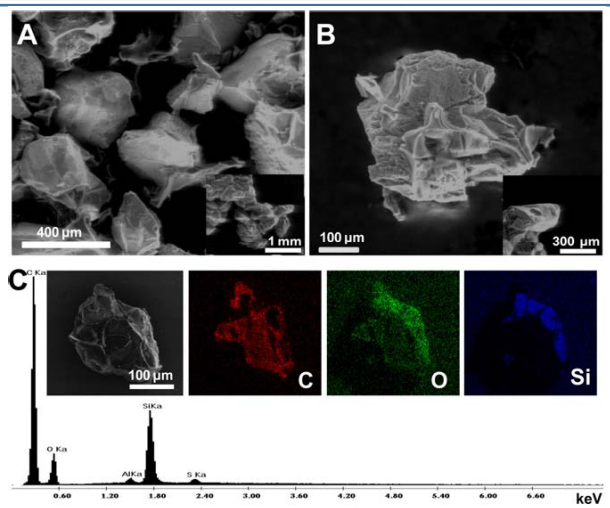


Figure: (A and B) SEM images and (C) EDAX spectrum and the corresponding elemental maps of GSC (5% Loading).

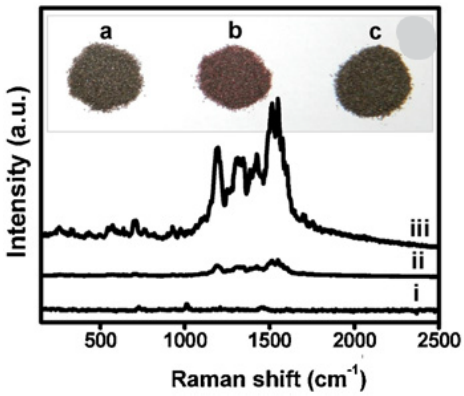


Figure: Post adsorption SERS analysis of adsorbent of R6G spiked water sample after passing (i) 2 L, (ii) 3.6 L and (iii) 4.8 L through the column. The inset shows the photograph of (a) GSC, (b) rhodamine-6G (R6G) adsorbed GSC and (c) GSC after regeneration.

Technology

Preparation of graphenic material on sand, starting from asphalt using a single-step strategy to immobilize the graphenic material on sand surface for removal of pollutants from water.

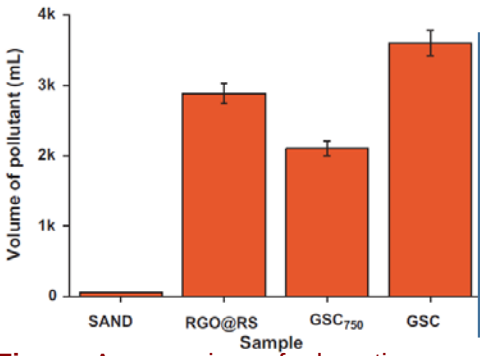
Asphalt is first treated with Toluene in the ratio 1:10 then the mixture is treated with sand to obtain a second mixture which is subjected to drying and heating at an optimum temperature of 400±5 °C and finally soaked in acid, washed with water and dried to obtain Graphene Sand Composie (GSC)

The graphene sand composite (GSC) is capable of adsorbing rhodamine-6G and chlorpyrifos, a dye and a pesticide respectively, and decontaminating water from such pollutants

Following batch adsorption experiments the filtrate was analyzed to quantify the target molecule R6G in the aqueous phase by UV Nis spectrophotometer based on absorbance at 527 nm. Analysis of CP was carried out at a wavelength of 297 nm. The effect of particle size, contact time, and adsorbent dose were evaluated by varying the parameters in the appropriate window.

Key Features / Value Proposition

- The process uses cheap and locally available asphalt As raw material. While using a simple strategy to immobilize the graphenic material on sand surface.
- The developed adsorbent surface is characterized by absence of oxygen functionalities. Avoiding such functionalities is highly desirable as it helps in reducing water solubility and improving the ease of regeneration of the adsorbent. Whereas, conventional adsorbents require laborious processes to regenerate.
- The developed GSC exhibits superior performance in removing pollutants from water when compared to conventional RGO@RS and GSC750 adsorbents.



Where:
GSC – invented Graphene Sand Composite

RGO@RS - Reduced Graphene oxide on River Sand

GSC_{750} - GSC using Graphene from sugar

Figure: A comparison of adsorption capacity with different graphenic adsorbents shows that the developed GSC is better at removing pollutant than conventional **RGO@RS** and **GSC_{750}** adsorbents

CONTACT US
Dr. Dara Ajay, Head TTO
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719