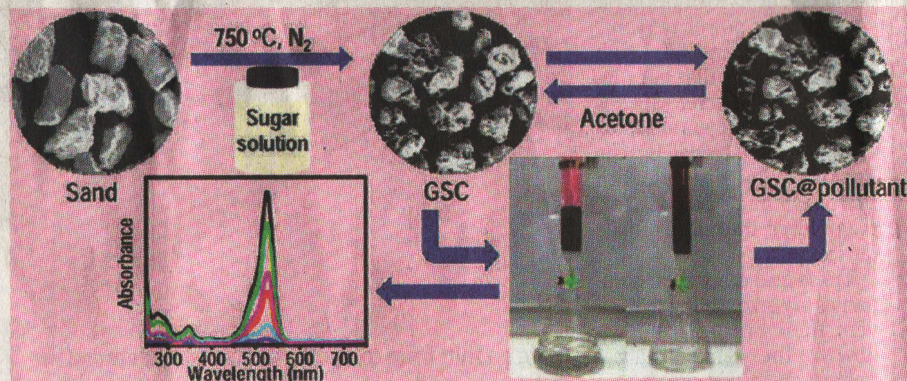


# GREEN CHEMISTRY, CLEAN EARTH

Graphene, the fascinating new addition into the carbon family, is opening up new vistas for research scientists around the world

By Sharath Ahuja

They are the modern-day 'alchemists' who have used commonly available materials – sugar and river sand, and with some very clever mixing, heating and cooling in a laboratory have successfully developed an amazing composite – the



Photographs of absorption columns using GSC for separating (A) Rhodamine 6G from an aqueous solution and (B) coloured matter from Coca Cola. PICS COURTESY PROF T PRADEEP, IIT CHENNAI.

Graphene Sand Composite or GSC.

In pioneering research utilising nanotechnology for the common man, Prof T Pradeep and his students from the DST Unit of Nanoscience, Department of Chemistry, Indian Institute of Technology (IIT), Chennai, have recently reported a green method for the synthesis of graphenic materials from cane sugar, a disaccharide, immobilising the mate-

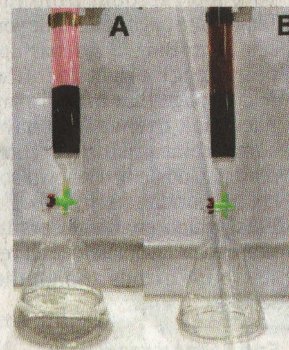
rial on sand without the use of a binder, and utilising the resultant graphene sand composite (GSC), for application in water purification.

It is graphene, which is being termed the fascinating new addition into the carbon family, and is opening up new vistas for research scientists around the world. Carbon, by the way, has been the most versatile material used for water purification in history.

It is known that charcoal was used for water purification by our forefathers. It is well documented that people of the Indus Valley civilisation used carbon and porous materials, such as earthen vessels, for filtering and storing drinking water.

## Sugar synthesis

Pradeep and his students synthesised the sugar-derived graphenic material on river



sand and demonstrated its utility as an active absorbent material useful for water purification applications. The uniqueness of their method is that no binder was used to prepare GSC. It was prepared by dissolving common sugar in water and then mixing it with requisite amount of river sand. Initial drying was done in an oven at 95° C, followed by heating in a silica crucible in a nitrogen atmosphere, in a pro-

grammed furnace upto a maximum of 750° C. To demonstrate the feasibility of using this unique composite, Pradeep and his students have conducted experiments and have reported that it effectively removes contaminants from water, such as a common textile dye, Rhodamine 6G, or Chloropyrifos – a pesticide, and even a coloured common soft drink – coke.

## Sweet breakthrough

There is no doubt that the discovery of graphene is one sweet breakthrough, and the remarkable material offers everything from faster, cooler electronics to cheaper lithium-ion batteries, but Pradeep and his team at IIT Chennai have gone one step further, using the unique features of graphene, blending it with river sand and developing a composite that will eventually be useful in water purification. Their 'Green Chemistry, Clean Earth' motto uses nanotechnology for the common man.