

# IIT-Gn makes nano god of small things

Researchers Create Boron Nanosheets Lakh Times Thinner Than Hair

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Ahmedabad: A team of the Indian Institute of Technology, Gandhinagar, (IIT-Gn) has achieved a scientific triumph by creating the world's first nanosheets made of boron. The IIT-Gn researchers say that the nanosheets — only three atoms thick — are among the thinnest materials crafted by humankind.

To understand the scale in everyday context, the nanosheets are one lakh times thinner than a strand of human hair or a paper sheet. But the size belies the sturdiness of the nanosheets, which show promise to become central to the development of the next-generation mobile and laptop batteries, green

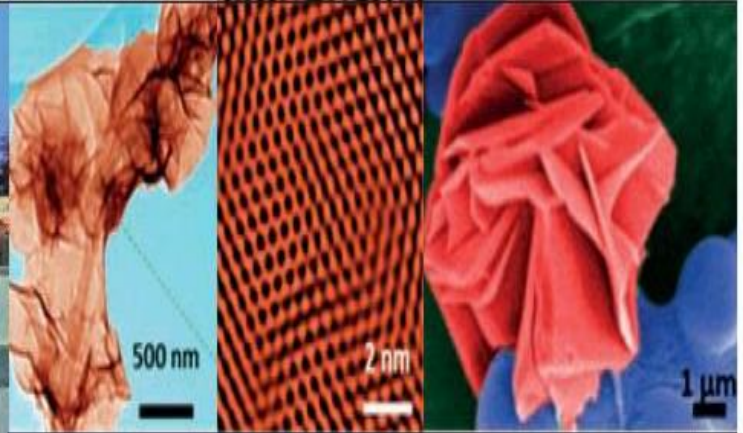
energy, and lighter but harder armours for the Indian armed forces.

"The nanomaterial we have synthesized has never existed before. This is an exciting development which opens further av-

## THICK AND THIN OF BORON NANOSHEET



Kabeer Jasuja and students



► Boron nanosheets have a thickness of 3 atoms or 1 nano-metre

► It would take 10 lakh nanosheets to obtain the thickness of a rupee coin

► One boron nanosheet is 1 lakh times thinner than a sheet of paper or a human hair, both of which have a thickness of 0.1mm

► Thickness of boron nanosheets is around half the thickness of the diameter of human DNA

### Use you can revolutionize

To make armours of armed forces lighter The IIT-Gn team is working to use boron nanosheets to create armour material which is sturdier but lighter

### To produce green energy

The nanosheets can be used as a new-generation catalyst for producing hydrogen gas by leveraging their interaction with water. "Since this process uses light instead of electricity, the energy generated is green," Jasuja said.

### To manufacture super batteries

The nanosheets can be used for super batteries which can store larger amounts of energy in smaller sizes. This effectively can shrink the size of mobile and laptop batteries.

### To prepare UV blocking coatings

Nanosheets can be possibly used in preparing UV (ultra violet) blocking coatings. These would make glasses which block UV light without changing the colour of the glass.

enues for the use of boron," said Kabeer Jasuja, assistant professor of chemical engineering. Jasuja and his team of doctoral students — Gunda Harini,

Saroj Kumar Das, and Asha Liza James — published their findings in ChemPhysChem journal.

Jasuja said the invention was the result of serendipity. The team stumbled upon it while working on a project to develop a re-

cipe for synthesizing nanomaterial from boron. The research on nanosheets has been centered on graphene, which represents the first such ultrathin nanomaterial obtained from graphite. The discovery won the University of Manchester scientists a Nobel Prize in Physics in 2010.

"We were working on a project to make a graphene cousin constituted from boron by using magnesium diboride or MgB<sub>2</sub>, a chemical commonly used in

labs," Jasuja said. "We observed that MgB<sub>2</sub> dissolved in water just like sugar. But dissolved sugar never reunites to form crystals again. However, when this solution was left undisturbed for 36 hours, the dissolved species surprisingly started to come together again."

More importantly, the recrystallisation did not happen in the conventional three-dimensional way, but in the form of extremely thin sheets. "The boron

atoms in these nanosheets arranged symmetrically in the form of a honeycomb which makes these nanosheets similar to graphene, a honeycomb of carbon atoms which is the world's thinnest material measuring only one atom thick," Jasuja said.

Jasuja said that the team will now investigate the properties of boron nanosheets vis-à-vis graphene nanosheets and work on projects to harness the material's utility for society.

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