Brahmaputra basin has 10,106 glaciers occupying 20,542.75 sq. km of glaciated area. The 27 glaciated sub-basins in the Brahmaputra basin have been mapped.

It was observed that the percentage of accumulation area was highest in the Indus basin compared to the other two basins; however, it was almost similar for the Ganga and Brahmaputra basins. The ratio of accumulation to ablation area was also high in the Indus basin, and it was almost similar for the Ganga and Brahmaputra basins. This indicates that the glaciers of the Indus basin have larger feed area and hence are relatively more stable compared to the other two basins. The percentage of ablation area debris cover was almost similar for the Ganga and Brahmaputra basins, and low in the Indus basin. The ablation area ice exposed was highest in the Indus basin, and it was almost equal for the Ganga and Brahmaputra basins. Also, for these basins the accumulation–ablation area ratios were low and most of the glaciated areas had varying amounts of debris cover. The thick debris cover plays an important role by stopping the heat from sun rays in reducing the melting of glacier ice. However, the status of these glacier features depends on its altitude and latitudinal distribution.

The mean area under various glacier classes like accumulation area, ablation area, glacierieters and snow fields, supraglacier lakes and moraine-dammed lakes area have been studied for the three glaciated basins. The Indus basin has high mean accumulation, low mean ablation area along with low mean supraglacial lake and mean moraine damned lake area, which shows that this basin is more stable compared to the Ganga and Brahmaputra basins. It has been observed that low mean accumulation area of the Brahmaputra basin along with relatively higher mean area for supraglacial lake and moraine-dammed lake could be serious for glacier health and stability, compared to the Ganga basin which has relatively high mean accumulation area and high mean ablation area.


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solution of AgNWs was introduced on the cotton by means of a pipette. The resulting cotton material was used in destroying bacteria. The device was operated at an optimum bias of 20 V. The application of a moderate bias enhances the bactericidal character of the AgNWs. It was observed that when water containing *E. coli* was passed through the device nearly 90% of the bacteria were destroyed and the inactivated bacteria were present in the treated water.

Every year, two million people die from waterborne diseases and billions more suffer from illness. Much of this ill-health and suffering can be prevented. The WHO drinking-water guidelines, released on 4 July 2011, call on governments to improve the quality of their drinking water (http://www.who.int/en/). The removal/destruction of *E. coli* gains importance from the following statement (http://www.who.int/en/): ‘Countries in the WHO European Region have reported significant numbers of infections from verocytotoxin-producing *E. coli* O104 : H4, resulting in a large number of cases of bloody diarrhoea and haemolytic uraemic syndrome in Germany, and in 15 other countries in Europe and North America. More recently, another cluster of cases in the region of Bordeaux, France, as well and a single case in Sweden, have been reported.’

In 2004, physicists from Manchester University first isolated graphene by mechanical exfoliation of small mesas of highly oriented pyrolytic graphite. Within the last few years, graphene has received special attention from the scientific world due to its unique mechanical and electrical properties. Therefore, the race to prepare graphene in large quantities is unabated. One important method involves the oxidation of graphite to graphite oxide (GO), exfoliation in solution and subsequent reduction by a variety of reducing agents. GO is readily obtained by modified Hummers method. The success of the developed CNT device for filtration of *E. coli*, prompted Gao et al. to employ an inexpensive material like GO to remove heavy metal ions like mercuric ion and dyes. It has to be pointed out that graphene is composed of only sp² hybridized carbon atoms that impart hydrophobic character. On the other hand, 60% of the carbon atoms in GO are sp³-hybridized and oxidized, mostly in the form of alcohols, epoxides and also as lactols, whereas the remaining 40% of the carbon atoms remain sp²-hybridized, mostly as unfunctionalized alkene or aromatic carbons, but also as carbonyl groups in lactols, esters, acids, and ketones (see Figure 2). The oxygen-containing functional groups not only impart hydrophilicity, but also exhibit limited complexing capacity with mercuric ions. It is therefore not surprising that Gao et al. preferred the amphiphilic GO as a material for purification of water.

It is a well-known fact that for more than six millennia India and some other countries use sand–gravel filtration bed to get clean water. In the municipal water supply such a bed is invariably employed. Although ordinary sand is effective in removing biological waste from polluted water, it cannot eliminate heavy metals. Therefore, Gao et al. converted conventional sand granules to ‘core–shell’ adsorbent granules in which the GO coating imparts nanostructural features on the surface of sand granules. The process involves mixing of the water-dispersible GO colloids with sand, followed by a mild heat treatment causing the nanosheets to adhere to each other over the sand surface, likely through van der Waals interaction.
resulting material is termed GO SAND. Figure 3a provides details of the process of preparing GO SAND. From Figure 3b one can easily visualize the change in colour of the sand from yellowish-white to blackish-grey after the coating process. In the inset of Figure 3b is shown the idealized schematic of the many-layer GO coating and the resultant GO SAND filtration granules.

EDAX analysis and Raman spectral studies of the modified sand confirm many-layer GO coating and the resultant GO SAND filtration granules.

The experimental results obtained by Gao et al.16 certainly establish that this novel ‘core-shell’ adsorbent system that contains nanostructured GO coating (GO SAND) can sequester heavy metal or organic contaminants at a five-fold higher capacity than regular sand and will enable exploitation of GO as a novel material for low-cost water purification processes.

**Figure 3. a**, Flow chart and schematic illustration for the preparation of GO SAND. **b**, Photographic images of sand and GO SAND product. (Inset) Idealized schematic of conversion of regular sand to GO SAND. Reprinted with ACS permission from Gao et al.16. Copyright (2011) from American Chemical Society.


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