

Graphene Oxide-based hybrid filter for water purification

N. A. Kapuruge and D. R. Jayasundara

Department of Physics, University of Colombo, Colombo 03, Sri Lanka; dilushanj@phys.cmb.ac.lk

Providing drinking water for the local public is one of the greatest issues faced by governments, especially in developing countries. With the development of industries, we witness a gradual increase in pollution of readily available drinking water sources. Therefore it is important to reduce water pollution and hence water purification methods should be coupled with new technologies in order to make science beneficial for the people.

Textile industry is one of the largest industries in the world. The textile dyeing industry consumes large quantities of water and produces large volumes of waste water from different steps in the dyeing and finishing processes. Wastewater from printing and dyeing units are often rich in color, contain residues of reactive dyes and chemicals, such as complex components, many aerosols, high chroma, high COD and BOD concentrations as well as much more hard-degradation materials.

The recent emergence of an apparently new form of kidney diseases has led to a serious public health crisis in many Asian countries. It has been suggested that heavy metals in drinking water could be a cause of these new diseases¹. Therefore it is important to pay attention to the field of heavy metal filtration as well.

Membranes made of Graphene Oxide (GO) have recently been developed for use as perfect molecular sieves, blocking all molecules or ions except water². Graphite deposits in Sri Lanka are of its high purity (above 99%) with extensive mineralization and restricted occurrence. In this study we have developed a hybrid filter by using GO made from Sri Lankan graphite used it to filter common dyes used in the industry such as Reactive Black. Further we also have found that water containing heavy metals like lead, chromium and arsenic can be filtered using the same GO-hybrid filter. Optimization and control of the filtration process to make it a viable low cost solution was carried out by studying the mechanistic details of the filtering process.

Furthermore, we have successfully regenerated the filter material and the performance of the regenerated filter material was also studied.

References

1. J. H. Redmon, M. F. Elledge et al., Additional perspectives on Chronic Kidney Disease of Unknown aetiology (CKDu) in Sri Lanka – lessons learned from the WHO CKDu population prevalence study, *BMC Nephrology*, 2014, **15**, 125. <http://bmcnephrol.biomedcentral.com/articles/10.1186/1471-2369-15-125>.
2. W. Gao, M. Majumder, et al., Engineered Graphite Oxide Materials for Application in Water Purification, *ACS Applied Materials and Interfaces*, 2011, **3(6)**, 1821-1826.