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The University of Manchester's exciting potential for water decontamination with the support of ELGA LabWater

MANCHESTER 1824
The University of Manchester

WATER TECHNOLOGIES

PURELAB® Quest enables world-leading graphene research

Graphene-based membranes

Researchers at the National Graphene Institute (NGI) at the University of Manchester are developing a range of new applications for the world's first two-dimensional material. These include the development of graphene-based membranes that have exciting potential for cleaning up contaminated industrial water, desalinating seawater and purifying gasoline from water. The team requires ultrapure water to carry out sophisticated molecular separation experiments to test the effectiveness of their membranes.

Even at a submicron thickness, graphene oxide (GO) membranes exhibit great mechanical strength and flexibility - and can form a perfect barrier to liquids and gases while allowing water to pass through. They can effectively separate an organic solvent from water and remove water from a gas mixture to an exceptional level. The simplicity of the technique, and the sophistication of these membranes, means that the scope for their potential for real-world applications continues to widen.

Ultrapure water is key for experimental success

Scientists in the Department of Chemical Engineering & Analytical Science are currently looking at how graphene-based membranes can be used for water filtration, gas separation and desalination projects.

The team needs access to a supply of ultrapure water for the synthesis of their graphene-based membranes and to carry out a variety of molecular separation techniques - including forward/reverse osmosis, electrochemical diffusion and pressure-filtration experiments - to study their performance.

These techniques involve placing a graphene-based membrane to divide a chamber into two sections - and then placing a salt solution (or other solution of an organic compound) into one chamber and water into the other. The researchers then study the diffusion of ions from one chamber to the other to find out how well the membrane separates ions from the mixture - for example, sodium and chloride from seawater.

As the concentration of ions is in the parts per million range and sometimes parts per billion, using high-quality ultrapure water is critical to the success of these experiments.

> “Our solutions must be free from all ions otherwise our measurements will be wrong,” explains Dr Vinod Kumar Puthiyapura, Postdoctoral Research Associate. “Our results will show the membrane has poor performance if the water quality is poor - but it won’t actually be because the membrane is bad, but because the water used for the experiment is bad.”

A consistent and reliable supply of ultrapure water

An **ELGA PURELAB® Quest** laboratory water purification system, which is positioned on a bench and attached directly to a sink tap, provides the facility with a reliable and convenient supply of ultrapure water (18.2 MΩ).

As well as meeting the scientists’ daily requirements of around five to eight litres of high-quality water per day for their experiments, they also appreciate several other features of the system.

> “It’s compact and robust. The high flow rate is good for our purposes and we have had no issue with water quality. We especially like the start/stop switch, which is very quick and convenient,” describes Vinod. “Although we haven’t changed the consumables yet, it looks quite easy as the two doors are at the front.”

The laboratory can directly compare the **PURELAB® Quest** with their previous laboratory water purification system, the Millipore Direct-Q® 3. “We really like the high flow rate and the continuous, controlled flow of water. We just can set it to dispense a fixed amount and leave it - there’s no such feature on the Millipore,” explains Vinod.

> “And it’s generally much easier to operate - the switches are much more convenient.”

The researchers had also experienced issues with their Millipore Direct-Q® 3 that impacted on their time when carrying out experiments. They also found that the tap dripped constantly, even when it was switched off - so they had to place a vessel underneath it all the time to collect the excess water. “The low flux on the Millipore meant that we had to wait for up to five minutes to get enough water,” says Vinod.

> “And the switch is very, very annoying - it’s a bit tricky to use and some people would have to stand there with their finger on it for around two to 15 minutes, depending on the amount of water they wish to dispense.”

Key features of the PURELAB® Quest:

- Generates high-quality ultrapure, pure and ro water directly from the tap
- Competitively priced with a low running cost
- Multiple water quality sensors & inbuilt periodic recirculation to constantly monitor & guarantee water purity
- Compact design for minimal lab space
- Simple plug and play installation
- Fast flow rate for quicker reagent preparation
- Easy to use and maintain
- Uses reclaimed materials for minimal environmental footprint

World-leading graphene researchers recommend the PURELAB® Quest

Vinod sums up why he recommends the **ELGA PURELAB® Quest** to other laboratories with similar ultrapure water requirements:

> “I would certainly recommend the **PURELAB® Quest** for anyone looking for a system that is convenient to operate, has a good flow rate, provides 18.2 MΩ water quality - and comes in a compact unit that saves lab space.”

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Dedicated to Discovery

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ELGA Labwater are specialists in the engineering, service & support of water purification systems.

Unrivalled product design has achieved international recognition and awards.

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