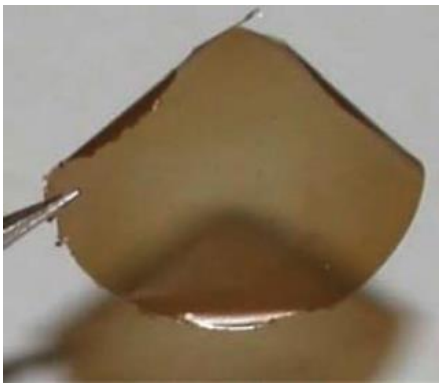
Graphene Oxide Pervaporation Membrane

BACKGROUND



Graphene oxide membrane

In many industries, the removal of water is vital for quality assurance, purification and concentrating of liquids, this is of particular importance in the energy, food and chemical sectors. In the energy sector the presence of water can have detrimental complications as it can lead to corrosion of the infrastructure resulting in costly downtime. The chemical sector requires the removal of water for a variety of reasons, for example the dehydration of solvents such as ethanol which forms azeotropes with water or for the removal of water in esterification's bias the equilibrium in favor of the products. Currently dehydration is facilitated either by energy intensive distillation, by the addition of molecular sieves or more increasingly by the use of pervaporation. Current pervaporation membranes are made from polymeric materials that can be detrimentally affected by high temperatures or solvents.

THE TECHNOLOGY

Academics at the University of Manchester (UoM) have developed a pervaporation membrane that utilises the inherent water transportation properties of graphene oxide (GO) to act as a selective water permeable barrier for dehydration applications. The UoM GO pervaporation membranes are porous to water but impermeable to gases/molecules larger than 9Å when hydrated thus enabling the separation of water molecules from liquid and/or gas mixtures. It provides a more cost effective and more selective alternative to currently employed dehydration processes.

KEY BENEFITS

- Fast transport of water vapour through the membrane
- Membranes are impermeable to everything but water vapour
    - Reduced solvent loss
- Separation of water from mixtures that would not tolerate distillation
- Low energy intensive alterative to distillation or molecular sieves
    - No chemical drying
    - No manual charging
    - No generation of wastewater
- Simple membrane preparation from readily available raw materials

- Durable and extended lifetime
- Recyclable
- Simpler production methods

APPLICATIONS

- Dehydration or drying of compounds
- Concentration of compounds from aqueous media
- Reaction biasing, for example the removal of water in esterification reactions
- Separation of compounds that form azeotropes with water

INTELLECTUAL PROPERTY

WO2014/027197 - The application has entered the national phase and has been filed in a number of territories worldwide.

OPPORTUNITY

We are seeking a licensee or an industrial collaborator to further develop and commercialise this technology.

PUBLICATIONS

Unimpeded Permeation of Water Through Helium-Leak-Tight Graphene-Based Membranes
Nair et al, Science, 335, 442, 2012.

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