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Intellectual Property **UMIP®**

REDUCED GRAPHENE OXIDE BARRIER COATING

Impenetrable protective barrier on surfaces that physically separates them from the corrosive effects of the environment

BACKGROUND

The ability of a material to withstand its environment is critical to ensure performance and safety. Damage and corrosion from harsh environments can cause materials to fail prematurely or can limit the choice of material for certain applications where moisture, salts, solvents and varying pH are present.

The impact of corrosion has created tremendous demand for corrosion inhibitors across the globe. Industries such as petroleum, cement and concrete, pulp and paper, metals, water treatment, power generation, chemical processing, mining and transportation, and manufacturing industries (such as electronics and textiles), aircraft, automobile, highway bridges, hydroelectric power, nuclear industries and processing all have a high demand for the prevention of corrosion.

Graphene derived barrier coatings can provide versatile protection from corrosion and damage from destructive environments. Reduced graphene oxide (rGO) made by the chemical or thermal reduction of graphene oxide (GO) is one such derivative that can form an impenetrable protective barrier on surfaces that physically separates them from the corrosive effects of the environment.

THE TECHNOLOGY

Academics at the University of Manchester (UoM) have produced a rGO based barrier coating that can be utilised to protect a wide array of surfaces from environmental attack. Readily available GO is chemically reduced to form an impenetrable barrier that it is impermeable to all gases, liquids and aggressive chemicals. A choice of chemical reducing agent gives further control over the barrier properties and manufacturing processes, for example an environmentally friendly and non-toxic reducing agent has been demonstrated. A range of surfaces can be coated from metals to plastics and even the rough surface of a building brick.

The UoM chemically reduced rGO coatings are completely impermeable to liquids and vapours and have been tested for resistance against a variety of aggressive environments such as saline (sodium chloride solutions and iron chloride solutions), concentrated acids (nitric, hydrogen fluoride and hydrochloric) and 100% humidity at elevated temperature.

KEY BENEFITS

- Barrier coatings are flexible when applied to plastics. Folding, stretching and moderate scratching can be tolerated with no loss in performance
- Impermeable to gasses and liquids up to two orders of magnitude lower than the industry standard barrier of aluminised PET
- The barrier coatings produced are capable of meeting stringent industry requirements for ultra-low permeability to helium and water
- Non-toxic reducing agents can be used for the food and pharma sectors, these have the added benefit of being more environmentally benign
- Optically transparent coatings are possible
- Lastly, these membranes have better surface adhesion to metals allowing for a range of benefits such as protecting important components of machinery

APPLICATIONS

- Packaging for perishable products e.g. foodstuffs, cosmetics, pharmaceutical products
- Protecting electronic devices such as organic light emitting diodes or LCD screens
- Protecting against corrosion on metals from large structures such as buildings, bridges or vehicles to small structures such as important components of machinery such as computer chips or hard drives
- Containment of nuclear waste or spillages in the nuclear industry
- Potential applications as a textile such as waterproofing clothes

INTELLECTUAL PROPERTY

A patent application has been filed to protect this technology in a number of worldwide territories.

PUBLICATIONS

Impermeable barrier films and protective coatings based on reduced graphene oxide. Y. Su, V. G. Kravets, S. L. Wong, J. Waters, A. K. Geim & R. R. Nair doi:10.1038/ncomms5843

OPPORTUNITY

We are seeking a licensee or industrial collaborator to further develop coatings tailored to their specific barrier needs.

UMIP REFERENCE

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