Superomniphobic Paper

Cellulose-based paper substrate that is both superhydrophobic and superoloephobic

Georgia Tech inventors have produced a cellulose-based paper substrate that is both superhydrophobic and superoloephobic. The superomniphobic paper is made by using a solvent exchange process, where the water in the pulp is replaced with sec-butanol. The butanol prevents hydrogen bonding between individual fibers, which allows the necessary fiber spacing to support oil droplets. The solvent process establishes the necessary structure to support high contact angles greater than 150 degrees, which is a significant improvement over current paper coating technologies. This technology also has the ability for variations and modifications without departing from the basic concept presented here.

Summary Bullets

- Cost effective
- Higher oil repellency than currently available
- Can be modified to repel other substance

Solution Advantages

- Cost effective
- Higher oil repellency than currently available
- Can be modified to repel other substance
- Durable and more functional than other omniphobic surfaces

Potential Commercial Applications

- Paper-based packaging
- Fiber-based oil-proof surfaces
- Bioassay/Biopharmaceutical industry (e.g., to detect antibodies or disease from blood samples)

Background and More Information

Typical, everyday paper (newspaper, writing paper, etc.) is a cellulose-based paper made from wood fibers that have been dried from a suspension in water and pressed into a flat sheet. This kind of paper is both hydrophilic and oleophilic, meaning it readily absorbs both water and oil. Certain applications, such as biochemical assays, could benefit from a surface that repels water (hydrophobic), oil (oleophobic), or both. Currently, paper is coated

with layers of waxes or polymers in order to make it hydrophobic/oleophobic; however, these coatings can degrade over time and may cause undesirable properties to the paper. Creating other hydrophobic/oleophobic surfaces requires adding an array of nail head-shaped nanostructures using a complex lithographic process, but this approach is not cost effective and requires special materials. Paper can be produced inexpensively and is flexible and strong; therefore, there is a need for a superamphiphobic paper and a method of making it.

Inventors

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Publications

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Images

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