

Permanent air layer under water reduces friction and prevents fouling & corrosion

Field of application

Surfaces that can hold a gas layer under water are of great technical interest. The application potential ranges from friction reduction and antifouling coating in shipbuilding, chemical engineering and pipeline construction, use in the textile industry as a new type of thermal insulation to sensor technology and many more.

State of the art

In order to prevent fouling of a ship's hull below the water surface, either biocide-containing paints or coatings that are particularly easy to clean are currently used in shipbuilding. However, none of the solutions can guarantee a permanent protection of an area under water in an environmentally friendly way, especially if the surface is not moved on a regularly base.

Innovation

Funded by the Baden-Württemberg Stiftung gGmbH, researchers at the Karlsruhe Institute of Technology led by Prof Dr Thomas Schimmel have developed a novel surface technology that can hold gas molecules between the surface and surrounding liquid over a long period of time. Like their natural model, the leaves of the floating fern *Salvinia molesta*, the ingenious coatings have structures that are highly hydrophobic near the surface but hydrophilic at the interface to the liquid. This creates areas that are not wetted by the liquid and in which gas is held by the surface tension of the surrounding medium. The configuration of the structures can be adapted to different pressure conditions.

At the same time, the layer acts as a corrosion inhibitor because, for example, the metal of a ship's hull is no longer in direct contact with seawater. Another advantage of the new surface technology is the reduction of the friction energy to be overcome while driving. The reduction of friction between ship and water through the air layer alone is conservatively estimated to be at least 10 %. In addition, savings are achieved by completely avoiding fouling; this also effectively prevents introduction of alien species.

Technology transfer

Technologie-Lizenz-Büro GmbH is responsible for the exploitation of this technology and assists companies in obtaining licenses.

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Your benefits at a glance

- ✓ Permanent air retention under water
- ✓ Environmentally friendly, biocide-free antifouling & corrosion protection for moving & stationary objects
- ✓ Retrofitting coating possible (as film)
- ✓ Numerous other areas of application: Liquid transport, thermal insulation, reaction vessels ...



Figure: Water drop on leaf hair of *Salvinia molesta* [Prof Schimmel, Karlsruhe Institute of Technology].

Patent portfolio

Patents granted: CN 10 427 125 9 A, JP 2014-559125 and US 2015/0273791 A1; EP 2 822 704 and further applications (BR, CA, CN, DE, IN, JP, KR and US) pending.

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Reference number: 12/006TLB