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A Built-In Mechanism Of Gas Maintenance In Microfeatures On A Submerged Surface

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SUMMARY

UCLA researchers in the Department of Mechanical and Aerospace Engineering have developed a novel superhydrophobic surface for drag reduction and anti-biofouling applications.

BACKGROUND

Superhydrophobic surfaces have unusual ability to repel water and may have utilities for applications including hydrodynamic drag reduction, de-icing, anti-corrosion, and anti-biofouling. For underwater applications, these surfaces must maintain their superhydrophobicity while submerged in a liquid. However, most superhydrophobic surfaces cannot retain the gas layer that makes them superhydrophobic under water in realistic conditions. Several approaches have increased the stability of the gas layer, but most of them are only preventive measures and are ineffective once the gas layer is disrupted.

INNOVATION

UCLA researchers led by Professor Chang-Jin Kim have developed a novel superhydrophobic surface using a microstructured surface with a built-in mechanism to generate and maintain gases on the surface in submerged environments. This innovative technology does not require an external power source to generate the gas and can be utilized to reduce drag on boats, increase flows through pipes, or prevent biofouling on surfaces.

APPLICATIONS

- ▶ Superhydrophobic surfaces
- ▶ Anti-biofouling coatings
- ▶ Water repellent and de-icing
- ▶ Drag reduction for boats
- ▶ Pipes or channels
- ▶ Anti-corrosion coatings

ADVANTAGES

- ▶ Generates and maintains gas on superhydrophobic surface
- ▶ Works in submerged environments
- ▶ Does not require an external power source

STATE OF DEVELOPMENT

Superhydrophobic surfaces have been fabricated and proven.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,365,585	07/22/2025	2015-021
Germany	Issued Patent	3169624	09/06/2023	2015-021
France	Issued Patent	3169624	09/06/2023	2015-021
United Kingdom	Issued Patent	3169624	09/06/2023	2015-021
Republic Of Korea (South Korea)	Issued Patent	10-2378963	03/22/2022	2015-021

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INVENTORS

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OTHER INFORMATION

KEYWORDS

superhydrophobic, superhydrophobic surfaces, microstructures, hydrophobic, anti-fouling coatings, anti-biofouling, submerged environments, microfluidic channel coating, water repellent, drag reduction, metal protection

CATEGORIZED AS

- ▶ **Biotechnology**
 - ▶ Health
 - ▶ Other
- ▶ **Engineering**
 - ▶ Engineering
 - ▶ Other
- ▶ **Medical**
 - ▶ Other

RELATED CASES

2015-021-0

Japan	Issued Patent	6773638	10/05/2020	2015-021
China	Issued Patent	107074524	01/17/2020	2015-021
Germany	Published Application	4303451	01/10/2024	2015-021
European Patent Office	Published Application	4303451	01/10/2024	2015-021
France	Published Application	4303451	01/10/2024	2015-021
United Kingdom	Published Application	4303451	01/10/2024	2015-021
United States Of America	Published Application	20180320717	11/08/2018	2015-021

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Methods of Restoring and Maintaining Gas Film on Superhydrophobic Surfaces while Underwater](#)
- ▶ [Complete Transfer of Liquid Drops by Modification of Nozzle Design](#)
- ▶ [Stereo Image Acquisition By Lens Translation](#)
- ▶ [Method of Fluid Manipulation By Electrodewetting](#)
- ▶ [No-Assembly Devices for Microfluidics Inside a Cavity](#)
- ▶ [Liquid-Repellent Surfaces Made of Any Materials](#)
- ▶ [On-chip, Real-time Feedback Control for Electrical Manipulation of Droplets](#)
- ▶ [Micropumping of Liquids by Directional Growth and Selective Venting of Bubbles](#)

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