



Zwitterionic Nano-Adhesives for Improved Wet-Adhesion

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BRIEF DESCRIPTION

An atomically smooth thin (< 2 nm) glue layer on various surfaces including mica, silicon wafers, and copper.

BACKGROUND

Despite recent advancements for wet-adhesion, practical underwater adhesion has its limitations for many applications including patching ship hulls, assembling electronics, healing surgical wounds, and other diverse applications. Scientists have overcome these limitations by utilizing certain proteins found in mussels. Catecholic zwitterionic molecules are used to achieve a very strong wet-adhesion, are adaptable for diverse surfaces at multiple length-scales, and hold promise for nanofabrication. However, translation of mussel-inspired wet adhesion typically entails catechol-functionalization of polymers and/or polyelectrolytes, and solution processing of many complex components and steps that require optimization and stabilization.

DESCRIPTION

Researchers at the University of California, Santa Barbara have utilized catecholic zwitterionic molecules to form an atomically smooth thin (< 2 nm) glue layer on various surfaces including mica, silicon wafers, and copper. These molecules allow for strong adhesion by being held together by hydrophobic reactions with the surrounding liquid. By combining Dopa content with hydrophobic and electrostatic functionalities, scientists can tune the performance of both coacervation and adhesion. The strength of adhesion and film dimensions hold promise for nano-length scale tailoring, e.g., electronic devices, that require a strong and defect-less nano-glue layer to obviate the interfacial failure causing fatal multifunction, and Li-ion battery anodes, that currently use a thick polymer adhesive binder reducing the power delivery and energy storage capacity.

ADVANTAGES

- ▶ Adaptable for diverse surfaces at multiple wavelengths
- ▶ Atomically smooth adhesive (< 4 nm)
- ▶ Very strong wet-adhesion (47mJ/m^2 , the highest value to date)

APPLICATIONS

- ▶ Electronics, including Li-Ion batteries
- ▶ Medical adhesives
- ▶ Ship repair

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,415,939	09/16/2025	2015-581

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Mussel-Inspired Underwater Adhesives/Coatings From Renewable Resources](#)

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OTHER INFORMATION

KEYWORDS

indadhesive, underwater,
mussel, glue

CATEGORIZED AS

- ▶ [Materials & Chemicals](#)
- ▶ [Other](#)

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