

Bioinspired Glue for Marine Applications

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- Chemistry and Chemical Analysis
- Materials and Manufacturing

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- Polymers
- Waterproof

Shellfish are the natural experts of underwater adhesion. Organisms like mussels, barnacles, and oysters attach to underwater rocks with ease, yet man-made adhesives struggle significantly in wet environments. When submerged, glue interacts with water molecules prior to attaching to a surface. These interactions reduce the strength of the adhesive. However, the common blue mussel attaches itself via a mixture of atypical proteins cross-linked into an adhesive. By understanding this biological phenomenon, a similar, more effective product can be produced.

A Purdue University researcher has developed a polymer mimic of mussel adhesives with exceptional underwater bonding characteristics. The researchers examined adhesive strength of a catechol-polystyrene polymer as a function of polymer molecular weight and composition, resulting in a polymer composition that proves to be the strongest underwater adhesive compared to commercial marine glues. The glue's adhesion is stronger in saltwater versus deionized water, making the polymer a viable marine adhesive.

Advantages:

- Stronger than natural mussel adhesive
- Stronger than commercial marine adhesives
- Stronger in saltwater

Potential Applications:

- Underwater adhesive
- Construction and repair in marine and wet environments

Related Publications:

J. Wilker, et al. High Strength Underwater Bonding with Polymer Mimics of Mussel Adhesive Proteins. ACS Applied Materials & Interfaces, 2017. <http://pubs.acs.org/doi/abs/10.1021/acsami.7b00270>

People:

- Wilker, Jonathan J (Project leader)

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