Docket #: S22-272

High-strength reusable and recyclable underwater adhesive

Stanford researchers in the Bao Lab have designed hydrophobic perfluoropolyether (PFPE) polymers that can be applied in underwater conditions, at room temperature, without any solvent or curing steps, and can be reused and recycled.

Unlike other approaches which use bio-inspired designs, this method uses dynamic polymers with a strong hydrophobic backbone that can be applied in fully underwater conditions to polyimide, glass, and steel substrates.

Stage of Development

- Proof of Concept

Applications

- **Biomarine or biomedical application** in which adhesion to wet surfaces is required
- Especially useful when adhesion needs to be repeatedly adhered and de-adhered or the adhesion needs to be done quickly

Advantages

- **Hydrophobic**
- **Similar performance** in both dry and underwater conditions
- **Strong adhesive -** 0.26 MPa within an order of magnitude of the best reported underwater adhesives
- **Rapid and simple application -** 2 seconds of light pressure- no need for a long curing time
- **Can be recycled and reused**

Publications

- Nogusa, T., Cooper, C. B., Yu, Z., Zheng, Y., Shi, Y., & Bao, Z. (2023). Tunable, reusable, and recyclable perfluoropolyether periodic dynamic polymers with high underwater adhesion strength. *Matter*.

Patents

- Published Application: 20240034915

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