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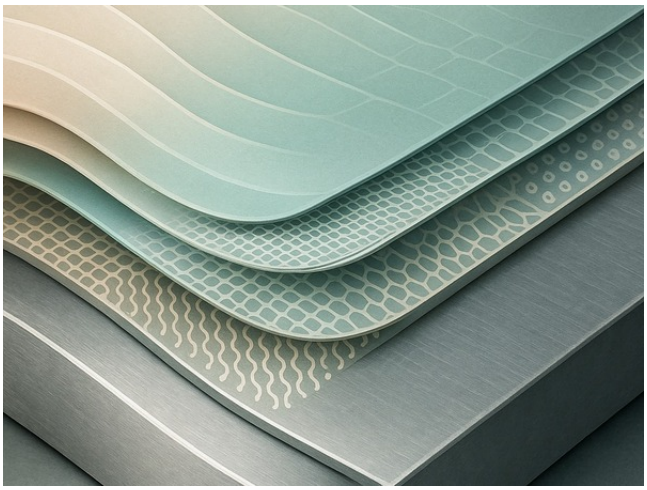
Influences of Phosphates on the Adhesion of a Catechol-Containing Polymer

Biomimetic catechol-phosphate polymers outperform industrial glues in wet adhesion and strongly bind to metals for coatings.



Purdue researchers have synthesized a biomimetic terpolymer-poly(catechol-phosphate), that has adhesive performance comparable to industrial glues and can also function as a coating for surfaces.

The research was inspired by ocean creatures which use adhesion to survive. The adhesive proteins of sea stars, mussels, and sandcastle worms are phosphorylated. Inspired by these organisms, the researchers synthesized several poly(catechol-phosphate) polymers, concluding that better adhesion occurs in both dry and wet conditions at higher phosphate concentrations. Compared to industrial glues, poly(catechol-phosphate) polymers performed with similar adhesion in dry conditions, and these polymers were more adhesive in wet conditions. Perhaps most significant was extreme wetting of steel surfaces by these polymers. Polymer-metal interactions were strong enough to suggest that a new class of strong binding coatings is now available. While poly(catechol-phosphate) polymers are a versatile alternative to industrial glues and coatings, they may also find applications as metal corrosion inhibitors and ion-exchange resins.

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Category

Chemicals & Advanced Materials/Coatings, Adhesives & Sealants

Chemicals & Advanced Materials/Materials Processing & Manufacturing Technologies

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Technology Validation: The researchers completed adhesion performance studies in both dry and wet conditions.

Advantages:

-Adhesion in both wet and dry conditions

-Biomimetic

-Versatile

-Extremely strong surface binding

Applications:

-Industrial glues

-Ion-exchange resins

-Metal corrosion inhibitors

-Coatings for metal surfaces

Recent Publication:

Influences of Phosphates on the Adhesion of a Catechol-Containing Polymer.
ACS Applied Polymer Materials

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Intellectual Property:

Provisional-Gov. Funding, 2020-09-03, United States

NATL-Patent, 2021-09-03, Europe

PCT-Gov. Funding, 2021-09-03, WO

NATL-Patent, 2023-02-24, United States

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