Covalent Organic Frameworks as Catalysts for Hydrolysis

Researchers at the University of South Florida have developed novel covalent organic frameworks (COFs) that are useful as catalysts for hydrolysis reactions.

COFs are often referred to as molecular LEGOs® that allow for the clear-cut integration of organic ligands into extended crystalline frameworks. They have a wide variety of applications such as catalysis, environmental remediation, and bio-related applications. COFs can provide a platform for the inclusion of a variety of different catalytic components, and the unique structures of COFs can enhance the efficiency of the catalysts in many different reactions.

Our researchers have synthesized novel COFs that enhance the efficiency of catalysts in hydrolysis reactions. For example, reacting an organic compound with water in the presence of the COF can allow one or more groups on the organic compound to be hydrolyzed in order to produce the corresponding hydroxyl group. These novel COFs are applicable to a wide range of hydrolysis reactions, and one such application is to convert toxic chemicals, such as nerve agents, to inert compounds. Nerve agents are organic chemicals that disrupt the mechanism by which nerves transfer messages to organs. Due to their organic nature, the COFs can hydrolyze specific group(s) on the compound to produce the inert hydroxyl group, allowing for quick remediation of nerve agent exposure. However, nerve agent degradation is just one example of the applicability of these COFs as they can be used in any type of hydrolysis reaction.

ADVANTAGES:

- **Enhance the efficiency of hydrolysis catalysts**
- **Applicable to a wide range of reactions**
- **Can be used to hydrolyze and degrade nerve agents**

Novel Covalent Organic Frameworks Used to Perform Hydrolysis Reactions

Catalyst	$t_{1/2}$ (min.)
COF-TPB-DHA-La	578
COF-TPB-DMA-DHA-La	82
COF-TPB-DMA-0.5DHA-La	533

Chart Shows the Catalytic Data of the Hydrolysis of Soman, a Nerve Agent

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