Covalent Organic Frameworks for the Capture of Waterborne Toxins

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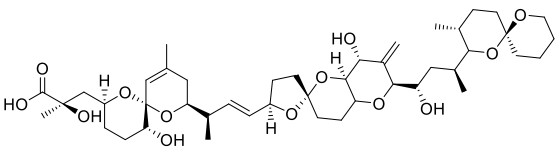
Nanoporous 2D covalent organic frameworks (COFs) are crystalline materials formed by the self-assembly of organic building blocks, driven by aromatic stacking interactions in the third dimension. Due to their structural tunability, large specific surface area, and low density, COFs show great promise for a wide variety of applications, such as catalysis, gas storage, adsorption, and optoelectronics.

The presence of biotoxins in food and water is a general threat to human health that causes yearly many diseases and even mortalities worldwide. Therefore, to prevent and remediate the negative impact of toxic outbreaks, it is important to establish efficient strategies and find new materials for biotoxin separation and water detoxification. COFs are interesting candidates for waterborne biotoxin encapsulation due to their tunable and uniform pore size and shape, which would allow for a more selective toxin capture in comparison to the commonly used macroporous resins.

We have prepared different COFs and evaluated their ability to adsorb marine toxin okadaic acid. Absorption capacity, desorption, and absorption kinetics were studied. A water-stable COF derivative was found to capture the toxin efficiently in both ultrapure water as well as synthetic seawater, showing the potential of these materials for water monitoring and detoxification applications.



Okadaic acid