MARINE

Researchers develop coating that shakes fouling material off ship hulls

David Szondy | February 4th, 2013

Zebra mussels fouling a marine sensor (Image: NOAA/Wikipedia)

Engineers at Duke University have developed a polymer that keeps ships' bottoms clean by twitching like living skin. The paint-like material combats hull fouling by preventing marine organisms from collecting on hulls by physically moving on the microscopic level and thus dislodging bacteria from the surface without toxic chemicals.

Marine life loves to colonize almost any solid surface if it gets half a chance and once a collection of seaweed, barnacles, mollusks, bivalves and worms sets up house they can turn even the sleekest of racing hulls into something about as hydrodynamic as a burst mattress. This can not only slow down the ship, but also reduce fuel efficiency as the vessel burns more fuel to drag along its unwelcome guests.

The conventional way of handling fouling is to coat the hull with antifouling paint. This is a bit of a tradeoff because, though there are alternatives in the pipeline, most antifouling paints currently in use are toxic - the ones based on copper particularly so.

Fortunately, preventing fouling doesn't mean having to take on full-grown barnacles. Fouling usually begins with bacteria setting up shop on the hull and forming a scum called biofilm, which acts as food for the larvae of larger animals that come later. If this bacteria can be kept off, fouling becomes much less likely.

TOP STORIES

"Synthetic human" CGI demonstrates eerie photorealism generated in real-time

Massive solar-powered tiny house rises like a Phoenix

Great Pacific Garbage Patch might be 16 times bigger than we thought

Laser weapons: Is this the dawn of the death ray?

The Duke approach builds on earlier work of Duke engineer Xuanhe Zhao, who has developed a way of causing polymers to deform when stimulated. This deformation can be either in waves and bumps or in specific patterns, so the polymer can be programmed to twitch in a way that is most effective in dislodging bacteria before it can establish itself.

"We have developed a material that 'wrinkles,' or changes its surface in response to a stimulus, such as stretching or pressure or electricity," said, Zhao. "This deformation can effectively detach biofilms and other organisms that have accumulated on the surface."

The original idea was to make a material that acts like the cilia used to sweep foreign particles from the lungs and respiratory tract and used by corals to keep themselves clean. However, reproducing the complex structure and motions of cilia is very difficult, so the current approach is more like a horse twitching its skin to shoo away a fly.

The team has tested the system in the laboratory using simulated seawater, biofilms and barnacles and they say that the polymer can be applied like a conventional paint. Aside from ships' hulls they see the polymer having applications in removing biofilms from artificial joint implants and water purification membranes.

The results of the team's research appear in *Advanced Materials*.

Source: Duke University

TAGS #BACTERIA #COATINGS #DUKE UNIVERSITY #POLYMER #SHIPS

SHARE THIS ARTICLE

SHOW 3 COMMENTS