Non-Leaching, Benign Antifouling Multilayer Polymer Coatings for Marine Applications

Pollution Prevention
PP-1454

Background:

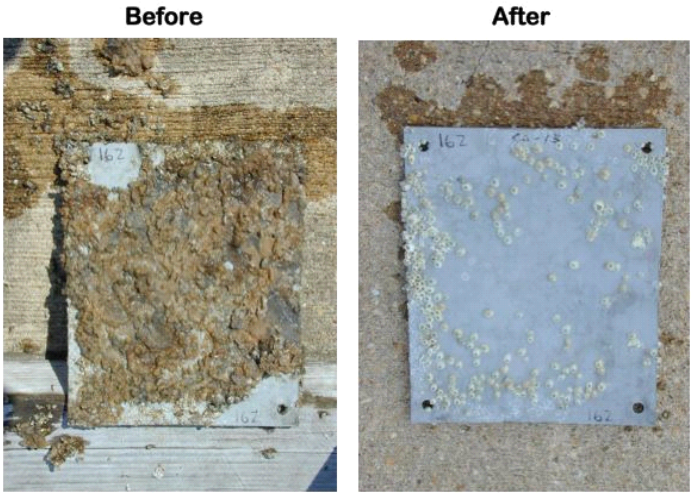
Marine biofoulants on a ship's hull increase drag as a vessel moves through water. This drag leads to increased fuel consumption, and it can limit the maximum attainable speed, impairing a ship's operational capability. To prevent this buildup, antifouling coatings are applied to the hulls of ships. Unfortunately, these coatings contain toxic metals such as copper that leach into the water and accumulate in harbors. Several nations plan to ban ships coated with these metal-containing paints from their harbors. Using current antifouling technology, Department of Defense (DoD) as well as commercial vessels will be denied access to critical harbors around the world. New environmentally friendly antifouling technologies are needed to replace the current, heavy metal-containing coatings.

Objective:

Building on research conducted under the SERDP SEED project **PP-1274**, the objective of this follow-on project is to develop environmentally friendly, copper-free, marine fouling release coatings. Using an innovative design based on control of surface energy as well as coating modulus, specific objectives include: (1) select an optimal, surface-active block polymer; (2) establish commercially viable approaches to synthesize antifouling coatings in large quantities; and (3) evaluate application processes for these coatings.

Process/Technology Description:

The antifouling coatings developed by this project will consist of two layers, an elastomer base layer and a surface-active block copolymer (SABC) fouling release layer. A thermoplastic elastomer (TPE) will be used as the base layer for these coatings since it provides corrosion protection, adhesion, durability, and is commercially available and relatively inexpensive. The antifouling properties of the coating will be provided by the thin SABC layer. Preliminary studies show that both nonpolar fluorinated and polar polyethylene, glycol-based SABCs show promise as antifouling coatings. This project will evaluate the molecular-level characteristics, performance, and fouling release behavior of these materials to determine which is superior and to provide the groundwork for possible commercialization of SABCs.



Test plaques illustrating successful copper-free barnacle removal.

Expected Benefits:

It is expected that this project will identify environmentally benign, durable, and effective antifouling coatings that will reduce toxic metal pollution from DoD and commercial vessels in domestic and foreign ports without sacrificing antifouling performance. The involvement of KRATON Polymers will facilitate possible commercialization of these materials and processes. These studies also are expected to enhance the fundamental understanding of fouling release behavior. (Anticipated Project Completion - 2008)

Contact Information:

Dr. Christopher Ober
Cornell University
Materials Science & Engineering
310 Bard Hall
Ithaca, NY 14853
Phone: (607) 255-8417
Fax: (607) 255-2365
E-mail: cober@ccmr.cornell.edu