We focused our efforts on laboratory and field studies of easy-release and antifouling coatings and their additives. Goals were: 1.) understanding how the best coatings prevent barnacle fouling; and 2.) developing the ability to predict when, and to determine why, coatings fail. Leaching of additives from foul release coatings plays a significant role in prevention of larval settlement on all of the best antifouling and foul release coatings. Some additives are broad-spectrum toxicants, while others are toxic to specific kinds of larvae by altering their immediate environment. All effective coatings produced leachates toxic to barnacle larvae. Measuring additive levels in coatings and the rate of leaching from experimental coatings into water can be used to predict when coatings will fail. In collaboration with scientists at the University of New Hampshire, we showed the utility of experimental approaches in which coatings were designed to fail predictably over time. In addition to this work, we met our responsibilities in the area of patents and publications.
FINAL REPORT

GRANT #: N00014-92-J-1516

PRINCIPAL INVESTIGATORS: Dr. Daniel Rittschof, Dr. Donald G. Gerhart, Dr. Anthony S. Clare

INSTITUTION: Duke University Marine Laboratory

GRANT TITLE: Nontoxic/Non-polluting Protection of Submerged Surfaces against Fouling

AWARD PERIOD: 1 January 1992 - 30 April 1995

OBJECTIVE: To investigate easy release and antifouling coatings and their additives through laboratory and field studies. The objectives were two-fold: 1) understanding how the best coatings prevent barnacle fouling; and 2) developing the ability to predict when, and determine why, coatings fail.

APPROACH: We developed, based upon type of fouling organisms, cluster analysis approaches to determine effectiveness of coatings.

ACCOMPLISHMENTS: The experiments showed that leaching additives play a significant role in prevention of larval settlement on all of the best antifouling and foul-release coatings. Some agents are broad-spectrum toxicants, while others may be toxic to specific kinds of larvae by altering their immediate environment. All effective coatings produced leachates toxic to barnacle larvae. Measuring additive levels in coatings and the rate of leaching from experimental coatings into water can be used to predict when coatings will fail due to additive depletion. In collaboration with scientists from the University of New Hampshire, we showed the utility of experimental approaches in which coatings were designed to fail predictably.

CONCLUSIONS: We showed that all effective coatings grow together with toxic coatings.

SIGNIFICANCE: We showed, in collaboration with scientists at the University of New Hampshire, the utility of experimental approaches in which coatings were designed to fail predictably.
PATENT INFORMATION:

(PATENTING & TECHNOLOGY TRANSFER--DUKE UNIVERSITY PROGRAM)

1. Costlow, J.D., Hooper, I.R., and Rittschof, D. Antifouling compound and method of use. U.S. Patent #4,788,302 awarded on November 29, 1988. (General subject area: antifouling agents from the octocorals Leptogorgia virgulata and Renilla reniformis). We are not actively pursuing this technology because it is less commercially feasible than our other related technologies.


ADDITIONAL RELATED INFORMATION - TRANSITION TO INDUSTRY:
STATUS OF DUKE-DEVELOPED TECHNOLOGIES:

An option to license the furan, lactone, and cyclohexene analogs is currently held by Rohm & Haas Company. Industrial application is being examined by this corporation.
Licensees are being sought for the steroidal antifoulant molecules. Industrial application is complicated by the toxic nature of these substances. However, specific industries have indicated an interest.

Technologies identified in the Costlow et al. patent (U.S. patent #4,788,302) are not under license. Licensees are not being sought. Potential industrial application is unlikely at this time due to the limited availability of the natural compounds or extracts containing them, and the expense associated with synthesizing and purifying active compounds.

AWARD INFORMATION:

PUBLICATIONS AND ABSTRACTS:


