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Study of Barnacles Biology and Investigation of Novel Marine Antifouling Coating

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Abstract

Engineered structures such as ships and marine platforms, as well as offshore rigs and jetties, are under constant attack from the marine environment. Biofouling can negatively affect the hydrodynamics of a hull by increasing the required propulsive power and the fuel consumption. This leads to increased costs within the shipping industry through the increased use of manpower, fuel, material and dry docking time. The use of antifouling coatings for protection from the marine environment has a long history. Since TBT was banned as an antifouling paint, therefore, development of pollution-free marine antifouling material is urgently required.

For this purpose, it is necessary to know the biology of marine sessile organisms, particularly barnacles. This paper reviews barnacles biology and the development of antifouling coatings for the prevention of marine biological fouling, and finally, the novel compounds were investigated that can be useful for antifouling coating.

Introduction

In the marine industry, the accumulation of living organisms on artificial surfaces by adhesion, growth and reproduction is known as biofouling. Biofouling is a particular problem for underwater structures, such as pipelines, cables, fishing nets, and bridge pillars [1].

The adverse effects of ship hull biofouling (Fig. 1) include: (i) Higher fuel consumption because the frictional resistance increased due to biofouling, making the hull rougher and the ship heavier. Fuel consumption increases of about 40% have been observed because of biofouling [2]. (ii) More expensive and time consuming hull maintenance, because drydocking operations need to be more frequent and longer with marine biofouling. Moreover, these cleaning processes generate a large number of toxic substances that are discharged into the ocean. (iii) Increased ship hull corrosion as the protective coating surface deteriorates because of
metabolic and other biological process. This makes the hull surface more susceptible to corrosion and discoloration [3].