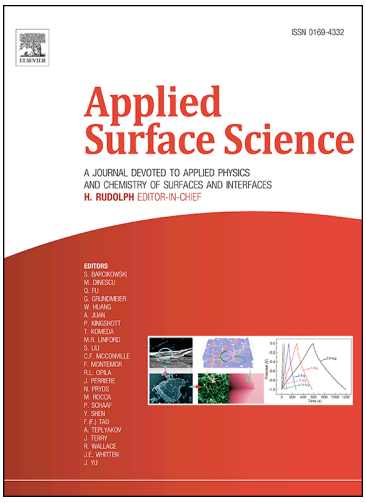

Full Length Article

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PII: S0169-4332(18)32585-6
DOI: https://doi.org/10.1016/j.apsusc.2018.09.160
Reference: APSUSC 40464

To appear in: *Applied Surface Science*

Received Date: 28 May 2018
Revised Date: 15 August 2018
Accepted Date: 19 September 2018

Please cite this article as: X. Huang, D. Wang, L. Hu, J. Song, Y. Chen, Preparation of a novel antibacterial coating precursor and its antibacterial mechanism, *Applied Surface Science* (2018), doi: https://doi.org/10.1016/j.apsusc.2018.09.160

Preparation of a novel antibacterial coating precursor and its antibacterial mechanism

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Abstract

In this study, a novel antibacterial coating precursor was generated from multi-walled carbon nanotubes (MWCNTs) dispersed in an ethanol solution containing polysilazane. The antibacterial properties of this coating precursor were further improved by depositing silver nanoparticles on the surface of MWCNTs. The silver nanoparticles on Ag-MWCNTs were 3–10 nm in diameter and were attached tightly the surface of MWCNTs. A micro nanostructure was achieved on the surface of DH36 marine steel using this precursor. The prepared coating containing Ag-MWCNTs reveals an interwoven three-dimensional through-hole structure. Hydrophobic experiment results showed that the water contact angle of the as-prepared coating was over 150° and sliding angle was below 1°. The antibacterial property of superhydrophobic surface were characterized through an immersion test in the saturated E. coli bacteria solution. Flat colony counting method measurement indicated that the antibacterial rate of superhydrophobic surfaces modified by MWCNTs reached 85% compared to the untreated control group, and the antibacterial rate of superhydrophobic surfaces modified with Ag-MWCNTs increased to 92.9%.

Keywords: superhydrophobicity, antibacterial property, polysilazane, Ag-MWCNTs, surface modification

1. Introduction

Due to the non-wettability, self-cleaning, anti-adhesion and other characteristics, superhydrophobic surface has drawn much attention from different fields [1], including anti-icing [2], anti-biofouling, antibacterial applications, corrosion protection [3, 4]. In recent years, numerous studies have been conducted on the antibacterial properties of superhydrophobic surfaces, and these studies have proposed that superhydrophobic surfaces have strong resistance to adhesion, which effectively