Desalination and Water Treatment
www.deswater.com

28 (2011) 83–87
April

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doi: 10/5004/dwt.2011.2205

Prevention of biofilm formation in water and wastewater installations by application of TiO_2 nano particles coating

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Received 1 February 2009; Accepted 1 July 2010

ABSTRACT

In this research we tried to prevent formation of a biofilm layer which is the major reason of biological corrosion by using TiO_2 coating. TiO_2 is a photocatalyst material which can produce free hydroxyl radicals and super oxide ions by receiving energy from UV light irradiation. These produced radicals are very strong oxidants which cause oxidation of organic materials, penetration in and deterioration of cellular membranes and cause inhibition of microorganisms and at last prevents the biological layer growth. In this research, TiO_2 thin films with antibacterial activity were prepared on glass slides (width = 2.5 cm, length = 10 cm) by using the sol–gel method. Samples with TiO_2 coating and control samples without TiO_2 coating, placed in the water containing various kinds of microorganism were exposed to UV irradiation. To study the thickness and the amount of biofilm formation the weighting method has been applied. After 30 d monitoring the control samples were covered by biofilm and this layer thickened. After analyzing data, it was shown that the growth of biofilm on the coating samples is less than the control samples. So this study shows that using of TiO_2 coating is an effective way for prevention MIC.

Keywords: Biofilm; Microbial influence corrosion (MIC); TiO_2; Water and wastewater facilities

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Presented at the 1st International Conference on Water and Wastewater Treatment, April 21–22, 2010, Isfahan, Iran