

TITLE: MICROBIOLOGICAL AND PHYSICO-CHEMICAL ANALYSIS ON THE ADHESION OF MICROORGANISMS IN 316 STAINLESS STEEL IN MARINE WATERS

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ABSTRACT:

Biofilms are small complex and dynamic ecosystems, formed by involved microorganisms in organic polymers matrix adhered to a surface. Microorganisms structuralized in biofilms demonstrates preference for the adhesion process in diverse inanimate surfaces, including stainless steel. The marine environment is a propitious environment for the association of microorganisms due to the speed of the waves, temperature of the environment, electrochemical potential of metallic substrates immersed in marine water and diverse other factors that propitiate this interaction. The present work reports the adhesion of microorganisms in 316 stainless steels immersed by 40 days in marine waters of Ilha do Boi and Manguinhos, Brazil. The study included the evaluation of the number of CFU/cm² in the surface of the steel coupons, physico-chemical analysis (pH, turbidity, temperature and dissolved oxygen) of the marine waters, images by scanning electron microscope and by microanalysis of chemical elements available in the surface of the steel with biofilms for energy dispersive spectrometry (EDS). The results revealed that not only the electrolyte influences the corrosion, but also the dynamics influenced by environmental characteristics, meteorological, chemistries, physics and dynamics of the microorganisms. The number of CFU/cm² showed a larger global count of heterotrophic mesophilic aerobic microorganisms in Manguinhos, observing the presence of cyanobacteria only in this environment. These were absent in Ilha do Boi, possibly due to the predominance of fungi on the steel surface immersed in this environment. The images of scanning electron microscopy suggest a higher material density in immersed coupons of the Manguinhos water, indicating a thicker film. The images authenticate the number of CFU/cm² data, which was the global count of microorganisms in Manguinhos. The microanalysis by EDS suggests decrease in iron concentration and the increase in oxygen concentration, indicating the formation of iron oxides as corrosion products was inevitably higher in the steel with biofilm of Manguinhos. The study of biofilm in stainless steel in marine environments is of extreme importance due to the dynamics of formation and interaction of them, becoming pathogenic and deteriorating organisms of the material in study. Structured microorganisms such as biofilms can reduce the useful life of equipment as well as compromise the marine water quality.

KEYWORDS: Biofilms, Corrosion, Stainless Steel, Marine Water.