

Asian Applied Microbiology 2020: Evaluation of biofilm formed by a bacterial consortium isolated from injection water from an oil field, in Colombia- Ana M. Arboleda, Universidad Industrial de Santander, Colombia

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Abstract

The pipelines are made of medium resistance materials but high tenacity such as carbon steels. However, there are different phenomena that attack these materials; one of them is Microbiologically Influence Corrosion (MIC). The prolonged contact of water, crude oil, salts, and microorganisms, through pipes in oil secondary recovery, generates on the internal surfaces, the phenomenon of MIC. The most common way MIC is presented is due to Sulfate-Reducing Bacteria (SRB) presence and their metabolic products such as hydrogen sulfide (H_2S). The main objective of this work was to monitor in detail biofilm formation and the corrosion mechanisms that occur at the metal-solution interface due to the effect of a bacterial consortium isolated from injection water of the oil industry, in Colombia. Monitored by Scanning Electron Microscope (SEM): EDS (Energy Dispersive X-rays spectroscopy), most-probable number technique (MPN), pH, consumption of H_2S , and sulfides in solution. Working electrodes preparation was sanding with different grammages, electrolyte preparation was carried out, sterilizing with a membrane filter the field injection water, the inoculum was prepared by adding 3 ml of injection water to 27 ml of Starkey culture medium. Reactors were autoclaved prior to inoculation monitored for 10 days. Biofilm formation and its effects after removing it from the steel coupon were evaluated with SEM. SEM analysis allowed us to observe in detail the biofilm formation composed of an extracellular polymeric substance, as well as bacteria adhered to a porous layer of corrosion products. Elemental analysis by EDS detects the presence of calcium carbonates, iron oxides, iron oxyhydroxides supporting the biofilm formation. Due to the formation of this biofilm, carbon steel was severely attacked showing localized pitting corrosion typically caused by the action of microorganisms.

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