SEM and EDS characterization of 316L Stainless Steel exposed to *P. fluorescens* and *S. aureus* in a rich growth media

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Microbiologically Influenced Corrosion (MIC) is the degradation of metals and other materials driven by microbial metabolic activity. Bacteria, fungi, and algae attach to surfaces, form biofilms, and produce by-products such as acids, sulfides, and ammonia that accelerate corrosion. MIC is a major concern in sectors such as oil and gas, water treatment, and marine engineering [1].

Samples of 316L stainless steel were polished to 1200 grit or further finished with 1 µm diamond paste and placed in Petri dishes containing nutrient-rich media inoculated with P. fluorescens, S. aureus, or mixed bacterial cultures from a corroded metal key. Samples were incubated at 37 °C for one, three, or six months, with media replaced weekly. After incubation, samples were ultrasonically cleaned in distilled water (5 s) to remove loosely attached bacteria and analyzed by Scanning Electron Microscopy (SEM) coupled with Energy Dispersive X-ray Spectroscopy (EDS).

No visible corrosion was observed after one or three months, confirming the high resistance of 316L stainless steel to MIC. After six months, corrosion products were detected on the metal surface, though no pitting occurred.

Consistent with biofilm development adherent bacteria and organic deposits were identified on the surface. Achieving higher corrosion rates for the study of mechanisms of pitting corrosion may require the use of modified media, selected microbial strains, or defined bacterial cocultures.

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References:

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