MICROBIOLOGICALLY INFLUENCED CORROSION OF MILD STEEL IN CRUDE OIL ENVIRONMENT

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ABSTRACT

In this study, the roles of microorganisms on the corrosion of mild steel in various simulated crude oil environments have been investigated experimentally under three (3) operating conditions namely: pH, salinity and nitrate. Since the presence of water supports microbial life, physicochemical properties and Total Microbial Count (TMC)) of the formation water was determined before adding it to crude oil. Corrosion analyses were performed by weight loss technique, microstructure examination and Fourier Transform Infrared Spectroscopy (FTIR). Microbiological analyses by isolation and identification using appearance factors were conducted on the biofilms formed. The result of physicochemical and biological characterization show that the levels of measured parameters favour the promotion of microbiologically influenced corrosion (MIC). The corrosion rates showed that high acidity (pH < 6) and high alkalinity (pH > 8) favours the growth and activities of microorganisms while increase in salinity and nitrate concentration of crude oil media hinders the growth and activities of microorganisms in the corrosion of mild steel. Microstructure examination depicted more severe pitting corrosion of mild steel in crude oil environment dominant in acidity than salinity and nitrate concentration. FTIR mainly revealed absorption band of –OH, COOH and NH_2 indicating the presence of extracellular polymeric substances (EPS). Seven isolates of bacteria, predominantly negative gram strain (Gram-negative), were observed. In all, this study provides valuable insight into the MIC of mild steel by bacteria in crude oil environments.

Keywords: Microbiologically Influenced Corrosion, Mild Steel, Corrosion rate, Crude Oil, Biofilm, Bacteria, FTIR.