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Evaluation of effect of variables on bio-corrosion rate of steel in crude oil simulated environment using RSM

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In this study, the influence of four operating parameters (pH, salinity, nitrateconcentration and immersion time) and their interactions on the corrosion rate of mild steel in simulated crude oil environments were investigated by response surface methodology (RSM). 4-level historical data design: pH (A) at 4, 6, 8, 10, salinity (B) at 25, 50, 75 and 100 g/l, nitrate (C) at 25, 50, 75 and 100 g/l and immersion time (D) at 168, 336, 504 and 672 h, was employed to correlate the factors with the corrosion rate as response. A polynomial regression model was developed and validated prior to optimization studies. The result showed that pH has the most influential effect on the response and that the predicted data had a reasonable agreement with the experimental data with the values of R2 = 0.9660 and Adj-R2 = 0.9516. The optimum conditions of the crude oil environments were observed at: pH (9.37), salinity (94.73 g/l), nitrate concentration (37.97 g/l) and immersion time of mild steel (168 h) in order to achieve minimum corrosion rate of 0.155196 mpy. The study has revealed that the historical data RSM design is an efficient statistical techniquefor predicting the optimum operating conditions of crude oil environments required to minimize mild steel corrosion in oil pipelines by incorporating all factors under consideration.

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