Using Electrochemical Impedance Spectroscopy Sinusoidal Potential Amplitude to Assess the Efficiency of Niobium Oxide Based Organic Coating in Oil Wells Produced Water

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The oil industry coexists with damages caused by corrosion of materials in almost all areas of activity. Recent discoveries in Brazil of potential oil reserves at deeper waters, commonly named “pre-salt oil layer”, may represent severe conditions leading to the need in developing new materials and technologies that meet unfavorable prospection demands. In this context, the corrosion protection characteristic of an organic coating based on niobium oxide immersed in water produced by oil wells was evaluated. The evaluation of the coating was carried out by means of electrochemical impedance spectroscopy technique (EIS). Results showed that only with the application of high voltage amplitudes of 350 mV over the OCP it was possible to decrease dispersion in EIS data, with no degradation or delamination of the coating. Despite this, at high voltage sinusoidal signal and raising the aggressivity of the medium, it was observed an increase in the corrosion mechanisms leading to lower impedance module values at longer exposure time (144 days), indicating the need for optimization of sinusoidal voltage amplitudes according with the nature, thickness and resistivity of the coating applied.

Keywords: electrochemical impedance spectroscopy, corrosion, organic coating, Nb₂O₅.

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