UNIVERSITI TEKNOLOGI MARA

CORROSION INHIBITION BEHAVIOUR OF PYRROLE AND PYRIDINE WITH THE PRESENCE OF OXYGEN SCAVENGER

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ABSTRACT

Carbon steel finds wide application in a broad field of industries as a material of construction. However, in the presence of the neutral chloride media, they are more exposed to corrosion activity. To overcome this problem, organic-based inhibitor should be added as a protection against internal corrosion carbon steel. In this study, two main organic-based inhibitors, which are pyrrole and pyridine, were added into the solution to improve the inhibition efficiency. The performance of pyrrole and pyridine in saline water were proven as an effective corrosion inhibitor. However, the performance of these inhibitors to protect carbon steel was investigated only in static condition and their efficiency is rather low (less than 30%). In reality, they are more exposed to fluid dynamic such as the flow in water pipelines. This research introduced the selected oxygen scavengers into the inhibited solution. The main objective of this research is to enhance the inhibition performance of pyrrole and pyridine by adding a selection of oxygen scavengers into the saline water at static and dynamic conditions. At the initial stage of work, different concentrations of each inhibitor was tested to obtain the inhibition efficiency. Then, the concentration of pyrrole and pyridine were combined with different of concentrations of different selected oxygen scavengers (hydroquinone, methyl ethyl ketoxime and erythorbic acid). The corrosion inhibition of pyrrole and pyridine was measured using the Linear Polarization Resistance (LPR). In static condition, the combination of pyrrole with hydroquinone, P-HQ4 (73%) achieved the lowest corrosion rate (0.067 mm/yr) compared to that of other combinations. For dynamic condition, the rotation speed was stimulated using the Rotating Cylinder Electrode (RCE). It was revealed that the combination of P-HQ4 gave significant results from laminar, transitional and turbulent flows compared to other combinations. The surface morphology and elemental analysis metal of specimen were analysed using the Scanning Electron Microscope combined with the Energy Disperse X-ray spectrometer (SEM-EDX) and Atomic Force Microscope (AFM). From these analyses, the combination of both inhibitors with hydroquinone gave better performance evidence from the smooth surface and small value of surface roughness.

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