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Self-healing polymer coating with the microfibers of superabsorbent polymers provides corrosion inhibition in carbon steel

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Abstract

In the present study, multi-layer polymer coatings composed of the microfibers of a superabsorbent polymer (SAP) were applied to carbon steel to promote corrosion inhibition. The SAP microfibers were fabricated by mixing SAP powder with water, which created a film that could then be coated onto a glass plate where it was allowed to dry and was then cut with a knife-edge using a 3-axis desktop robot. Water/polymer ratios between 20 and 60 produced SAP microfibers 30 to 50 μm in diameter. The prepared SAP microfibers were mixed with vinyl-ester polymer (VEP), and were then coated onto a substrate. Specimens were scratched with a knife-edge, and then polarization resistance in a 0.5 wt% NaCl solution was measured. A coating with VEP as the base and top layers and 5 wt% SAP microfibers as the middle layer showed polarization resistance that increased with testing time and demonstrated self-healing corrosion inhibition. A thin corrosion protective film formed on the scratched surface

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