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A Long-Term Stable and Environmental Friendly Self-Healing Coating with Polyaniline/Sodium Alginate Microcapsule Structure for Corrosion Protection of Water-Delivery Pipelines

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ABSTRACT: Recently, various self-healing materials have been proposed. However, there is a blank in the field of corrosion protection of water-delivery pipelines, because the self-healing performance is undesirable in the condition of water scouring and most of the encapsulated self-healing agents deteriorate the water environment during the self-healing process, rising the risk of human health damage. Aiming at solving the current problems, we successfully synthesize an environmentally friendly smart coating for corrosion protection of water-delivery pipelines. The coating contains a polyaniline shell and a sodium alginate core microcapsule structure and exhibits a hydrophobic surface, a steady thermo-stability, an acceptable tensile strength, and a good adhesion capability with carbon steel in a simulated water-delivery environment. From the experimental results, the coating exhibits a remarkable corrosion protection capability (99.9943%) after 50 days of immersion in corrosive medium. In addition, the scratch test indicates that the surface resistance recovers to 90% of the intact coating within 12 h, resulting from the formation of a sodium alginate / calcium alginate composite barrier layer in the defect region.

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