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Corrosion Protection of Epoxy Coating with Calcium Phosphate Encapsulated by Mesoporous Silica Nanoparticles

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Smart coatings are considered as a novel approach in the field of corrosion protection coatings and have drawn researchers' attention over the past years [1-3]. They are able to respond to external triggering that comes from the surrounding environment like changes in the pH, or mechanical stress, which leads to the release of healing or inhibitive species [4].

In the present work, mesoporous silica nanoparticles were successfully synthesized. A smart corrosion inhibition system was produced by formulating an epoxy coating with calcium phosphate encapsulated by the mesoporous silica nanoparticles as nanocontainers. The anti-corrosive performance of the epoxy coatings with calcium phosphate and calcium phosphate encapsulated in the nanocontainers after exposure to the salt spray chamber were compared. Electrochemical Impedance Spectroscopy (EIS) was used for the characterization of the coating properties and Scanning Acoustic Microscopy (SAM) was applied for the examination of the coating failure from the artificial defect. Results revealed the effect of the application of mesoporous silica nanoparticles as nanocontainers on the anti-corrosive performance of calcium phosphate on epoxy coatings.

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