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Dynamic Corrosion Prevention through Magneto-Responsive Nanostructure with Controllable Hydrophobicity

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Abstract : Corrosion prevention remains an indispensable concern across a spectrum of industries, demanding inventive and adaptable methodologies to effectively tackle the ever-evolving obstacles presented by corrosive surroundings. This abstract introduces a pioneering approach to corrosion prevention that amalgamates the distinct attributes of magneto-responsive polymers with finely adjustable hydrophobicity inspired by the structure of cicada wings, effectively deterring bacterial proliferation and biofilm formation. The proposed strategy entails the creation of an innovative array of magneto-responsive nanostructures endowed with the capacity to dynamically modulate their hydrophobic characteristics. This dynamic control over hydrophobicity facilitates active repulsion of water and corrosive agents on demand. Additionally, the cyclic motion generated by magnetic activation prevents the biofilms formation and rejection. Thus, the synergistic interplay between magneto-active nanostructures and hydrophobicity manipulation establishes a versatile defensive mechanism against diverse corrosive agents. This study introduces a novel method for corrosion prevention, harnessing the advantages of magneto-active nanostructures and the precision of hydrophobicity adjustment, resulting in water-repellency, effective biofilm removal, and offering a promising solution to handle corrosion-related challenges. We believe that the combined effect will significantly contribute to extending asset lifespan, improving safety, and reducing maintenance costs in the face of corrosion threats.

Keywords : magneto-active material, nanoimprinting, corrosion prevention, hydrophobicity
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