

Acid-Responsive Polymer Conjugates as a New Generation of Corrosion Protecting Materials

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Abstract : Protection of metals is a critical issue in industry. The annual cost of corrosion in the world is estimated to be about 2.5 trillion dollars and continuously increases. Therefore, there is a need for developing novel protection approaches to improve corrosion protection. We designed and synthesized smart polymer/corrosion inhibitor conjugates as new generations of corrosion protecting materials. Firstly, a polymerizable acrylate derivative of 8-hydroxyquinoline (8HQ), an effective corrosion inhibitor, containing acid-labile β -thiopropionate linkage was prepared in three steps. Then, it was copolymerized with ethyl acrylate in the presence of 1,1'-azobis(cyclohexanecarbonitrile) (ABCN) by radical polymerization. Nanoparticles with an average diameter of 140 nm were prepared from the polymer conjugate by the miniemulsion-solvent evaporation process. The release behavior of 8HQ from the the nanoparticles was studied in acidic (pH 3.5) and neutral media (pH 7.0). The release profile showed a faster release of 8HQ in acidic medium in comparison with neutral medium. Indeed 100% of 8HQ was released after 14 days in acidic medium whereas only around 15% of 8HQ was released during the same period at neutral pH. Therefore, the polymer conjugate nanoparticles are suitable materials as additives or to form coatings on metal substrates for corrosion protection.

Keywords : Corrosion inhibitor, 8-Hydroxyquinoline, Polymer conjugated, β -Thiopropionate

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