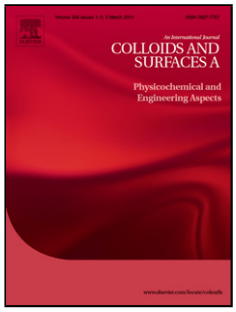

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Hybrid zinc coatings for corrosion protection of steel using polyelectrolyte nanocontainers loaded with benzotriazole

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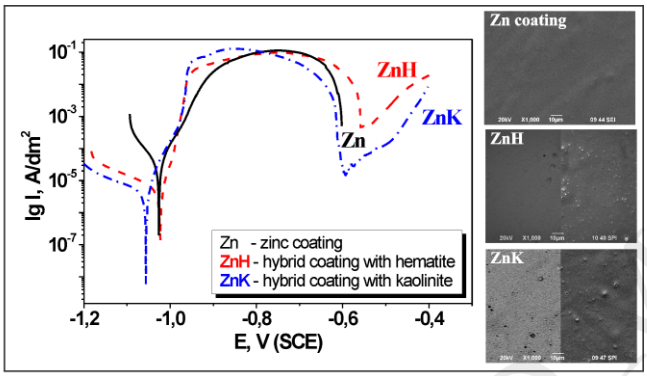
Graphical abstract



Abstract: Core-shell nanocontainers (NCs) with corrosion inhibitor benzotriazole (BTA) are fabricated by electrostatic self-assembly of poly(diallyldimethylammonium chloride) (PDADMAC) and poly(acrylic acid) (PAA) on kaolinite and hematite particles. BTA is entrapped within the polyelectrolyte shell in one assembly step. The growth of the polymer shells and stability of the NCs suspensions against aggregation are followed by electric light scattering and electrophoresis The NCs loaded with BTA are incorporated into the matrix of ordinary zinc coatings by electrodeposition on steel substrates from acidic zinc sulfate solutions. The influence of the NCs on cathodic and anodic processes is analyzed in the starting zinc sulfate solution with cyclic voltammetry. The scanning electron microscopy shows random (near to uniform) distribution of the NCs in both hybrid coatings. The protective characteristics of the hybrid coatings in model medium of 5% NaCl are followed by means of potentiodynamic polarization curves, polarization resistance measurements and electrochemical impedance spectroscopy. XPS method is applied for determination of the nature of additional products appearing on the coatings as a result of the corrosion treatment. Both hybrid zinc coatings reveal improved corrosion protection of steel as compared to the pure zinc coating, the