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Ureasilicate Hybrid Coatings for Corrosion Protection of Galvanized Steel in Cementitious Media

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Abstract

This study is focused on the electrochemical behavior and surface analysis of an eco-friendly organic-inorganic hybrid (OIH) coating for hot dip galvanized steel (HDGS) in contact with cementitious media. This treatment is a proposed alternative to replace toxic Cr(VI)-based pre-treatments used to control reactions between the zinc and wet concrete. HDGS samples were coated with two different sets of OIH gels obtained by a sol-gel process using a dip-coating method. Five distinct OIH matrices were obtained by reaction of functionalized metal-alkoxide (3-isocyanatopropyltriethoxysilane) with five different molecular weight diamine-alkylethers. One set of HDGS samples was coated with each of the five pure OIH matrices and another was coated with similar matrices doped with Cr(III). The morphology of OIH coatings over HDGS surface was characterized by SEM/EDS. Similar films were prepared separately and the respective resistivity was measured by electrochemical impedance spectroscopy. Polarization resistance and macrocell current density were used to evaluate the corrosion protection properties of the HDGS coated samples in contact with cementitious media for a period of 74 days. Results showed that the produced coatings provide barrier properties that withstand the high pH of the electrolyte, protecting the HDGS when it first contacts cementitious media.

Footnotes

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