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Preparation and Characterization of Phosphate-Nickel-Titanium Composite Coating Obtained by Sol Gel Process for Corrosion Protection

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Abstract : A strong industrial interest is focused on the development of coatings for anticorrosion protection. In this context, phosphate composite materials are expanding strongly due to their chemical characteristics and their interesting physicochemical properties. Sol-gel coatings offer high homogeneity and purity that may lead to obtain coating presenting good adhesion to metal surface. The goal behind this work is to develop efficient coatings for corrosion protection of steel to extend its life. In this context, a sol gel process allowing to obtain thin film coatings on carbon steel with high resistance to corrosion has been developed. The optimization of several experimental parameters such as the hydrolysis time, the temperature, the coating technique, the molar ratio between precursors, the number of layers and the drying mode has been realized in order to obtain a coating showing the best anti-corrosion properties. The effect of these parameters on the microstructure and anticorrosion performance of the films sol gel coating has been investigated using different characterization methods (FTIR, XRD, Raman, XPS, SEM, Profilometer, Salt Spray Test, etc.). An optimized coating presenting good adhesion and very stable anticorrosion properties in salt spray test, which consists of a corrosive attack accelerated by an artificial salt spray consisting of a solution of 5% NaCl, pH neutral, under precise conditions of temperature (35 °C) and pressure has been obtained.

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