The Relation between Structure and Corrosion Protection Performance of Hybrid Nanonanosilica/Sol-Gel Film

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The purpose of this work is to study the effect of nanofibrous SiO₂ on the corrosion protection performance of the sol-gel film coated on AA5052 aluminum alloy. The structure and surface morphology of the hybrid film were evaluated by Transmission electron microscope (TEM) and Scanning electron microscopy (SEM), the result highlighted that the surface of composite films appears uniform and the nanofibrous SiO₂ was evenly dispersed in the film. By analyzing the results of infrared spectroscopy, the addition of nanofibrous SiO₂ enhanced the cross-linking of the sol-gel film. The electrochemical behavior of coated samples was determined by electrochemical test. The corrosion protection performance of the sol-gel film had a great improvement with addition of nanofibrous SiO₂, the optimal additive concentration was 1 mg/ml at which the hybrid film showed the best corrosion protective performance in 3.5% NaCl solution. From the result of potentiodynamic polarization, the corrosion rate of sample coated with the sol-gel film with 1 mg/ml nanofibrous SiO₂ was about 6 times slower than pure sol-gel film coated sample.

Keywords: nanofibrous SiO₂; TEOS film; corrosion protective properties; electrochemistry

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