Influence of the Polyethyleneglycol Plasticizer on the Mechanical and Electrochemical Properties of Siloxane Hybrid Films Applied on Tinplate

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doi: 10.20964/2017.02.17

Received: 20 July 2016 / *Accepted:* 27 October 2016 / *Published:* 30 December 2016

The coatings developed by sol-gel process have been proven to be an efficient alternative for corrosion protection of metal surfaces, especially to replace the chromate technique. The sol-gel processes have several advantages, such as their high purity and an excellent distribution of the components. The objective of this work is to characterize the hybrid films morphologically and electrochemically with different plasticizer concentrations, obtained by sol-gel process applied on tinplate. The film was prepared with two alkoxide precursor, 3-trimethoxysilylpropyl methacrylate (TMSPMA) and tetraethoxysilane (TEOS) with addition of cerium nitrate. The polyethyleneglycol (PEG) was added in four different concentrations and their effect on the film was evaluated. The morphological characterization was performed by scanning electron microscopy and profilometry. The electrochemical characterization was performed using the electrochemical impedance spectroscopy (EIS) and the scanning vibrating electrode technique (SVET). The results showed that the enhanced performance was obtained with the coating containing PEG 20 g.L⁻¹ because the corrosion of the system, which was detected after 120 hours, showed only two small points of corrosion and only one active. The lowest amount of PEG improved the plasticity and the barrier properties of the hybrid film.

Keywords: tinplate; hybrid film; plasticizer; corrosion; SVET;

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