

The influence of pH on the hydrolysis process of γ -methacryloxypropyltrimethoxysilane, analyzed by FT-IR, and the silanization of electrogalvanized steel

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Abstract-

Silanes are commonly used as coupling agents to enhance the adhesion between polymeric and inorganic materials. Once silane hydrolysis has taken place, the condensation of the silane on the substrate surface should follow. Optimum hydrolysis conditions will depend on the type of silane and the process conditions of the solution. The pH is particularly important as it has a significant effect on the hydrolysis process. This paper deals with the hydrolysis process of 1 vol% γ -methacryloxypropyltrimethoxysilane (MPS) in aqueous solution at different pHs (2, 4, 6, 8 and 10). Because the hydrolysis rate is a function of pH, hydrolysis times, ranging from 2 min to 48 h, were studied. Fourier transform infrared spectroscopy was used to evaluate the chemical modifications produced by changing the hydrolysis time. The disappearance of the infrared band due to the Si-O-C groups and the appearance of the bands due to the Si-OH bonds were studied. It was shown that longer times were necessary for complete hydrolysis, under almost neutral pH conditions. On the other hand, the Zn-electrocoated steel was silanized with MPS under an optimum pH and the hydrolysis time conditions and the resulting surfaces were analysed by Reflection-Absorption Infrared Reflectance Spectroscopy.

Index Terms- γ -methacryloxypropyltrimethoxysilane (MPS), hydrolysis, FT-IR spectroscopy, galvanized steel

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