EXOSCAN

PRIMER PERCENT HYDRATION, ADHESIVE AND METAL SURFACES

Water is present in bonding primer, bonding adhesive and even in metal oxide surfaces as a result of the actual manufacturing process and specifications for these materials. However, because of ambient humidity and moisture, the amount of water present can vary depending on the weather, the season and the level of control of ambient conditions in the environment where these materials are used. This variability can be the source of an array of problems when these materials need to be used under strict specifications for level of hydration. On the other hand, the level of hydration is also a necessary attribute to the successful application of these materials, assuming that it is known and controlled.

FTIR spectroscopy is highly capable of detecting the presence of water in a wide range of materials including primers, paints, anodized coatings, bonding adhesives, etc. FTIR spectroscopy can be used to not only detect water, but also provide a determination of how much water is present in these materials. Thus, it provides useful quality control and quality assurance analysis for the materials before and during use.

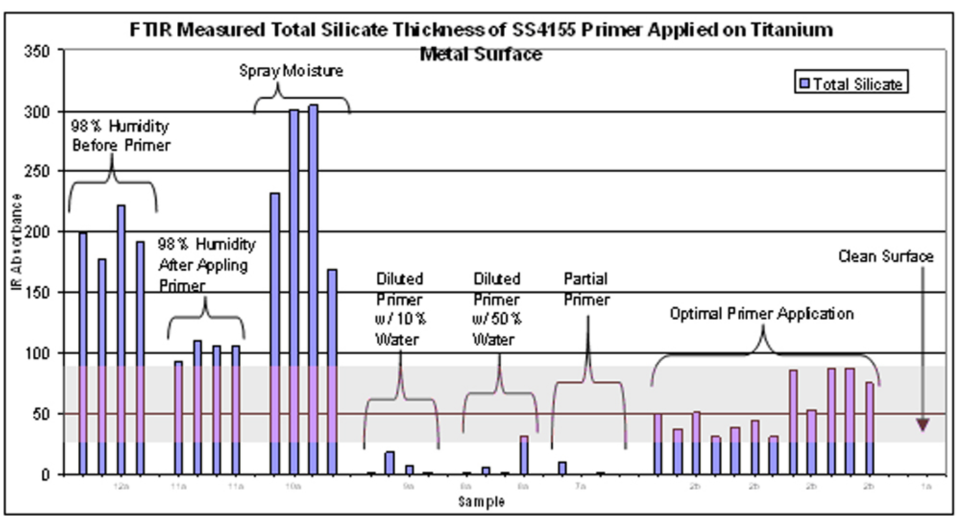

Figure 1 - The plot of primer thickness measured by silicate absorbance (Exoscan FTIR system) for titanium metal coupons with various hydration treatments.

Several samples of a silicone based primer used in aerospace applications were prepared and exposed to different environmental conditions including dilution of the primer by water, exposure to humidity pre cure and exposure to humidity post cure. In testing with the Exoscan, several differences were observed. In most cases, dilution of the primer or hydration led to variations in the primer thickness. These variations can be easily observed by measuring the peak area of the silicone oxide band. The variation seen in several samples is shown in Figure 1. For other samples which were exposed to humidity post cure, differences can be seen in the band shape of the silicone oxide band. Humidity can cause these primers to cross link, making them less effective for bonding. The cross linking is seen by the Exoscan as a change in the silicone oxide band shape. The shape differences are shown in Figure 2 where an ideal primer application is shown in red and the humidified primer is shown in blue. Figure 3 is a graph of the relative intensity of the primer bands showing a clustering of primer exposed to humidity post cure.

In the case of assessing the level of hydration in materials during the actual application of the materials, the Exoscan system is invaluable because it can provide rapid and immediate assessment directly where these materials are to be applied or otherwise used. Because the level of water in these materials can change fairly rapidly, the ability to get a near real-time assessment of the current level of hydration is important. For this reason, the ability to bring the Exoscan FTIR system to the site of the application is of paramount importance.

See page 2 for Figures 2 and 3

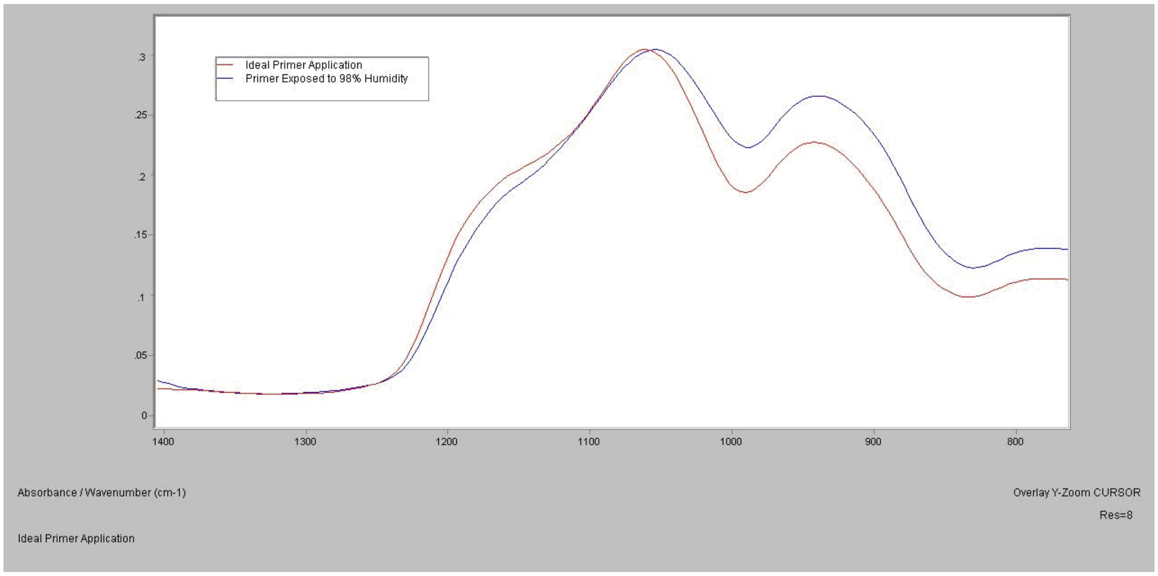

Figure 2 – Silicon oxide bands of optimal primer (red) and hydrated primer (blue) showing relative intensity differences due to cross linking.

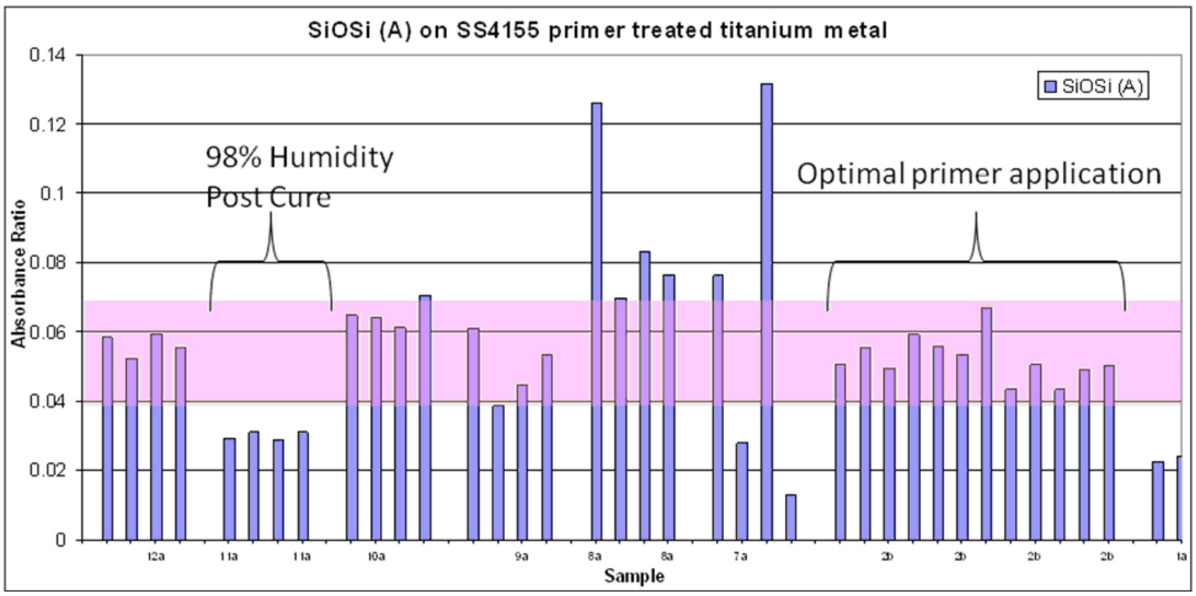

Figure 3 – Relative intensity of the Si-O bands which vary due to cross linking. Sample exposed to humidity post cure shows a different relative intensity when compared to optimal primer application.

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