The influence of primer on adhesion of silicone to silver and gold substrates

BACKGROUND

To investigate the influence primer has on the adhesion of a standard silica filled methyl silicone, EPM-2410, to silver and gold substrates.

MATERIALS

The materials used are listed below:

Silicone Adhesive: **EPM-2410**

EPM-2410 Material Properties	
Viscosity Part A	62,000 cPs
Viscosity Part B	40,000 cPs
Cure	15 minutes at 150 ° C
Durometer (Type A)	30
Tensile	750 psi (5.2 MPa)
% Elongation	350

Substrates:

- Gold Lap Shear Panels - Aluminum with Nickel flash and Gold plate per MIL-G-45204
- Silver Lap Shear Panels - Aluminum with Nickel and Copper flash, and Silver plate per QQ-S-365

Primers:

- SP-270- a specially formulated, clear primer designed for use with platinum-cured systems on substrates traditionally difficult to bond to such as gold and silver.
- SP-271- a specially formulated primer designed for use with platinum-cured systems for which conventional silicone primers are insufficient

EXPERIMENTAL METHOD:

Sample Preparation
EPM-2410 silicone was cured on primed and unprimed gold and silver coated lap shear panels. Three sets of lap shear panels were prepared for each sample combination: Primed-Gold, Unprimed-Gold, Primed-Silver, and Unprimed-Silver.

Lap shear panel sets were prepared and tested using the following procedure:

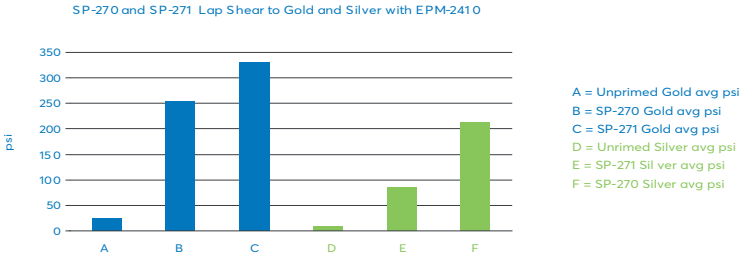
Adhesion strength was tested using Lap Shear, per ASTM D1009. The lap shear panels were pulled on MTS 1000 lb load transducer at ~ 500 psi for both SP-270 and SP-271.

RESULTS

The adhesion strength of unprimed and primed with SP-270 and SP-271 gold and silver lap shear panels bonded together with EPM-2410 are shown in the Table and Graph below.

Product	EPM-2410	
Substrate	Gold	Silver
Unprimed	24	7.5
Primed with SP-270	254	231
Primed with SP-271	331	85

*Average taken from 3 samples and is not to be used as a specification due to limited sample population.



CONCLUSION

The data reveals that SP-270 and SP-271 can significantly increase EPM-2410 adhesion to gold as well as silver plated aluminum panels. The SP-270 primer increased adhesion to gold by 10.6X and adhesion to silver by 23X. The SP-271 primer shows an even greater increase than SP-270 in EPM-2410 adhesion to gold plated and unabraided aluminum panels (~11X and ~31.5X), but as regards silver SP-271 did not perform as well as SP-270. The results of this study demonstrate that adhesion performance can be primer and substrate dependent: SP-270 appears to increase adhesion to silver more than SP-270; however, SP-270 showed better performance on gold

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