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TESTING OF RTV SILICONE ADHESIVES FOR HIGH TEMPERATURE APPLICATIONS

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ABSTRACT

Room temperature vulcanising (RTV) silicone adhesives are being increasingly used in a variety of space applications (i.e. satellites construction and space flight) as they are able to withstand the temperature extremes that are experienced in the space environment and are able to maintain a good degree of flexibility at very low temperatures. They are used when considerable expansion and contraction is expected in the joint and flexibility is required, as in the case of materials that have dissimilar coefficients of thermal expansion (CTE), since they can reliably compensate for the materials' different expansion properties. Actually, if considerable and rapid temperature changes produce thermomechanical stress within the adhesive, the flexible RTV silicone adhesives can dissipate this stress and keep it away from the interfaces.

In view of the very limited amount of published data on the mechanical properties of RTV silicone adhesives, we analyzed the performances of two RTV silicone rubber adhesives through bulk and adhesive joint tests. Tensile tests were performed to get the tensile properties of the adhesives. Also, the Standard Thick Adherend Shear Test (TAST) was performed in order to measure the shear properties of the adhesives. Single lap joints (SLJs) were fabricated and tested to assess the adhesive performance in a joint. The effect of bondline thickness and overlap length on the lap-shear strength of the adhesives was also studied. The reduction of failure load with an increase of the bondline thickness is a very common situation when dealing with structural adhesives. However, for the tested RTV silicone adhesives the failure loads increased as the bondline was made thicker. Also, the failure loads of RTV silicone adhesive joints increased almost proportionally with increasing the overlap length.

KEYWORDS: RTV silicone adhesives, Lap-shear strength, Failure load prediction.

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