Effect of moisture and temperature on thermal and mechanical properties of structural polyurethane adhesive joints

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Abstract-

The aim of this study was to evaluate the effect of humidity and temperature in the mechanical and thermal properties of two polyurethane adhesives joints. Single and double component adhesives were selected, in order to compare their different properties to join dissimilar materials (steel and carbon fiber composite). By means of two devices specially developed for the study, durability and heat-aging tests were performed. The ability of the adhesives to cope with temperature (72°C) and humidity (82%), and facing temperature variations (from 26°C to 72°C) was studied. Shear tests and Shore D hardness measurements were carried out after the specimens were subjected to different exposure times and adverse environments. Joint reliability was studied by means of a simplified Weibull model. Besides, differential scanning calorimetry and infrared spectroscopy were made to understand the changes produced in the adhesives. Different behaviors were found for each adhesive, but they showed good characteristics to be used in structural applications under adverse environments.

Index Terms- Polymer-matrix composites (PMCs); Environmental degradation; Mechanical properties; Thermal properties; FRP-steel bonded joints

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