

## A study on the effects of environment on curing characteristics of thixotropic and room temperature cured epoxy-based adhesives using DMTA

### ABSTRACT

This study investigated the thermal properties of three room temperature curing adhesives containing nano-particles which were thixotropic and shear thinning which allowed injection into overhead holes when exposed to different environmental conditions. Viscosity and shear stress of the adhesives were measured as a function of shear rate. The thermal behaviour of the adhesives were measured using dynamic mechanical thermal analysis following exposure to different temperatures and humidities which included temperatures of 20°C, 30°C and 50°C, relative humidities of 65% RH, 75% RH and 95% RH, soaked in water at 20°C and placed in the oven at 50°C. The dynamic thermal properties reported include storage and loss modulus, the loss tangent and the glass transition temperature ( $T_g$ ). For nano- and micro-particles filled adhesives, the  $T_g$  increased with the temperature increase, even though the adhesives were subjected to high humidity and this was due to further cross-linking. The results showed that room temperature cured epoxies were only partially cured at room temperature.

**Keyword:** DMTA; Epoxy-based adhesive; Glass transition temperature; Humidity; Nano- and micro-particles; Rheological properties; Thermal properties; Viscosity