AlphaSTAR

Curing Process Using MCQ-Cure Module in MCQ-Composites

Challenge

The challenge in this case study is to determine the behavior of Matrix material as a function of Time/Temperature given the cure parameters reverse engineered from various test such as Differential Scanning Calorimeter (DSC), Thermo Mechanical Analyzer (TMA) and Dynamic Mechanical Analyzer (DMA). MCQ cure module is employed to determine the following resin behaviors as a function of time/temperature: (**1**) Viscosity; (**2**) Degree of cure; (**3**) Resin Modulus; and (**4**) Volumetric Shrinkage.

The objective of this case study is to demonstrate how to setup the material properties and run curing analysis for 3501-6 resin system. Time dependent properties are obtained and compared with available test data.

Solution

The steps involved to in this case study are shown below:

- **Step-1:** Obtain curing parameters from DSC, TMA and DMA test data.
- **Step-2:** Define curing temperature cycle.
- **Step-3:** Perform curing analysis in MCQ-Composites.

Results & Conclusion

- Prediction time/temperature dependent viscosity, degree of cure, resin modulus and volumetric shrinkage.
- The curing analysis will provide the state of the material after the end of curing cycle.

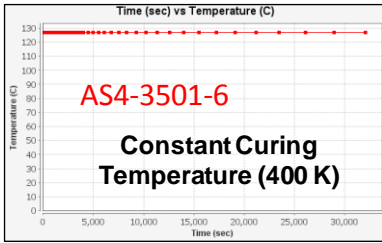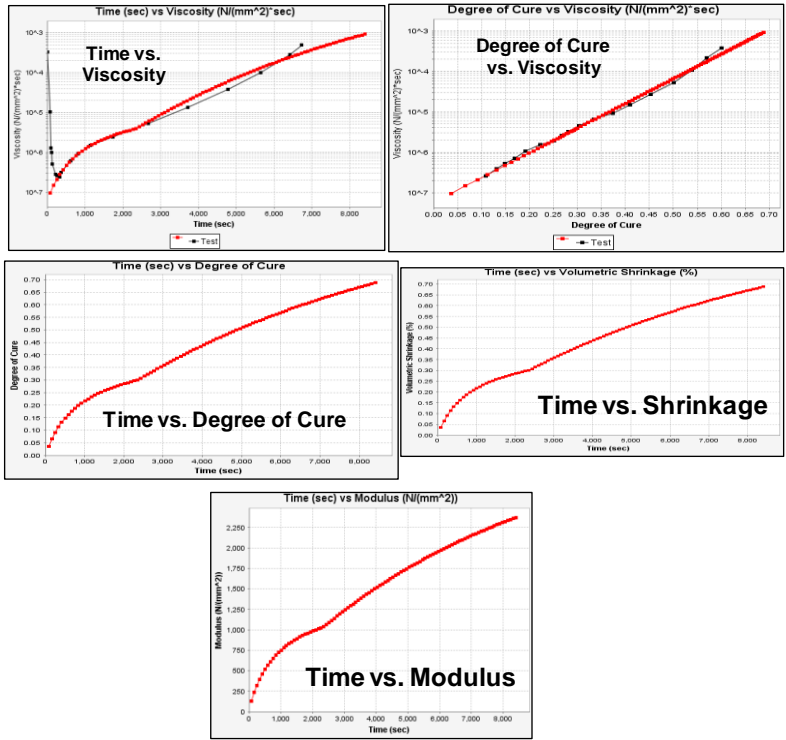| Key Highlights & Benefits		
Product: MCQ-Composites (Cure)		
Industry: Aerospace and Automotive		
Application: Manufacturing		
Benefits: Curing/Consolidation Analysis		

Related Publication

1. Process-Induced Stress and Deformation in Thick-Section Thermoset Composite Laminate, Journal of Composite Materials, Vol. 26, No 5/1992.
2. Heat of reaction, Degree of Cure, and Viscosity of Hercules 3501-6 resin, Journal of Composite Materials, Vol. 16, Nov 1982.

MCQ-Cure Test Validation for 3501-6 Resin System for Constant Curing Temperature
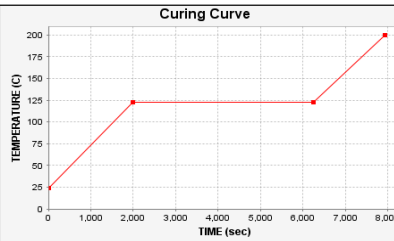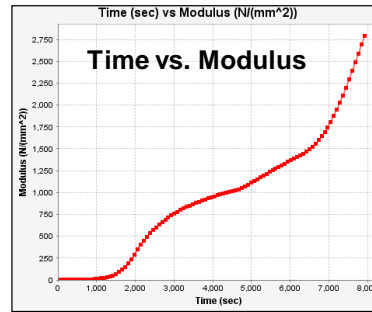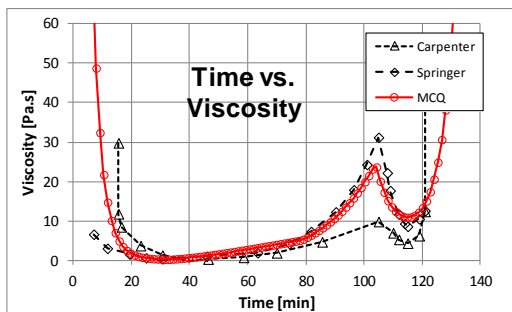
MCQ-Cure Test Validation for 3501-6 Resin System for Non-Constant Curing Temperature