RTM6 Epoxy resin: An In-Situ Rheo-Raman Study of Curing Kinetics and Dynamic Mechanical Analysis (DMA) of the Cured Material

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The kinetics of an RMT 6 epoxy resin and the thermo-mechanical properties of the finally cross-linked product were experimentally studied using an Anton Paar MCR 702 MultiDrive rheometer. In order to gain insights in the evolution of macroscopic rheological properties induced by chemical reactions within the sample material, the rheological measurements were coupled with in-situ Raman spectroscopy. The gelation-kinetics was further evaluated with a so-called Multiwave rheometry test. Accordingly, the WINTER-CHAMBON criterion was used to determine the sol/gel transition point [1]. For dynamic mechanical analysis of the cured component a linear drive module was added to the instrument. The combination of linear drive and rotational drive in one device allowed the characterization of thermal transitions using dynamic mechanical analysis (DMA) in two different deformation modes (torsion and bending). Two thermal events could be detected from the DMA test: the main glass transition temperature and a sub-glass transition of the material [2]. Additionally, this unique experimental setup allows determining the complex Young's modulus as well as shear modulus using a single specimen in a continuous measurement run over a wide temperature and frequency range. The instrument frame and air bearings are designed to provide outstandingly low radial and axial compliance at the same time, thus enabling the measurement of accurate modulus values in all testing modes.

Keywords: DMA, Epoxy, Curing, Kinetics, Dynamic Mechanical Analysis

References

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