The Thermal Cure of Phenylethynl Terminated Polyimides and Selected Model Compunds

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Abstract

The ability to process high performance polymers into useful adhesives and high quality composites has been significantly advanced by synthetic techniques in which oligomers terminated with reactive groups cure or crosslink at elevated temperature after the article has been fabricated. Several matrix resin systems of considerable interest to the aerospace community utilize phenylethynl terminated imide (PETI) technology developed at the Langley Research Center to achieve this advantage. This work addresses the cure chemistry of PETI oligomers.

The thermal cure of selected oligomers and model compounds was studied using a variety of analytical techniques including differential scanning calorimetry, high pressure liquid chromatography, Fourier transform infrared, nuclear magnetic resonance, electron spin resonance and mass spectrscopies and liquid chromatography – mass spectroscopy. Model compound studies indicate that the cure is extremely complex. Many stable products were isolated and attempts at identification were made. Initial cure mechanisms have been proposed based on experimental results. The intent of this research is to provide fundamental insight into the molecular structure of these new engineering materials so that their performance and durability can be more adequately appreciated.