DEVELOPMENT OF SHAPE MEMORY POLYMER FOR HIGH TEMPERATURE APPLICATIONS

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Cyanate ester (CE) based polymers are well known for aerospace and microelectronic applications due to their unique characteristics at higher temperatures. Due to the cyanurate network formed during the curing process, cyanate ester-based shape memory polymers have resistance to harsh environment conditions. Furthermore, the shape memory behaviour of CE based resins allows them to be a suitable candidate for high temperature applications which require shape memory effect. This study investigates the shape memory behaviour of bisphenol-A-cyanate ester (BACE) cured with polyethylene glycol (PEG) with five different ratios. The formation of cyanurate has been confirmed by the Fourier transform infrared spectroscopy (FTIR) analysis. The thermal stability of the developed material was confirmed using the Differential Thermal Analysis (DTA)/ Thermogravimetric analysis (TGA). It was confirmed that thermal stability remains up to 350 C^0. The shape memory behavior was successfully performed by the polymer with shape memory bending test. The modified resin with higher PEG ratios indicates higher shape recovery ratios whereas the resins with lower PEG ratios exhibit higher shape fixity ratios, tensile strengths, and hardness values. Using PEG as the switching segment, CE based resins can be used for high temperature shape memory applications and can be modified to obtain certain properties according to the PEG ratios.

Keywords: Shape Memory Polymer, Cyanate Ester, High Glass Transition Temperature, Shape Memory Characteristics