

SYNTHESIS AND CHARACTERIZATION OF THE POLYHYDROXYAMIDE/POLYMETHOXYAMIDE FAMILY OF POLYMERS

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ABSTRACT: The poly(hydroxy-amide) [PHA] family of polymers possess not only high temperature stability, but also form a more thermally stable polymer (polybenzoxazole) [PBO] during thermal decomposition. One drawback for PHA is the lack of a softening temperature before the onset of ring closure to PBO.

Poly(methoxy-amide) [PMeOA] has been synthesized and characterized. DSC and TMA have shown an endothermic transition occurring at 225°C, thus allowing thermal processing of the material prior to cyclization onset. The synthesis occurs in solution at low temperature, preventing premature ring cyclization to PBO. The molecular structure was confirmed from ¹H-, ¹³C-NMR, and elemental analysis. TGA displays a two-step degradation associated with ring closure to PBO (and release of small low-fuel molecules) and the thermal degradation of PBO, onsets at 350°C and 600°C respectively. From microcalorimetry, PMeOA has a heat release capacity, total heat release and char yield higher than PHA, but still lower than most polymers. Initial studies indicate that when a random distribution of methoxy and hydroxy monomers are incorporated into a polymer chain, the thermal properties are equal to or better than that of PHA.