Ultrahigh heat- resistance polybenzimidazoles from *Streptomyces*- derived biomonomers

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Introduction: Expertise in preparing high-performance biopolymers and their various applications such as; high temperature polyelectrolyte, high temperature insulating coating for motors etc. Those who have ideas in relevant fields please connect with me.

Renewable resources can provide a sustainable platform to substitute petroleum-based polymers through the design of bio-based polymers with a positive environmental impact Aromatic polybenzimidazoles (PBI) are considered as high- performance plastics due to their outstanding thermal and mechanical stabilities owing to strong π- π stacking interaction among aromatic and imidazole rings, and H- bonding between N- H and N of the imidazole ring. High-performance bio-PBIs were obtained using renewable starting material 3- amino- 4- hydroxybenzoic acid (3, 4-AHBA) derived from *Streptomyces sp.*(*J. Biol. Chem.* 2006, 281, 36944 and *Bioresour. Technol.* 2015, 198, 410). Copolymer polybenzimidazole / polyamide (PBI / PA) was prepared using 4-aminobenzoic acid (PABA) which has high environmental occurrence, and they were characterized and compared with respect to bio- PBIs. Polybenzimidazoles with polyamide unit incorporated show better solubility and processability as compared with the homopolymer ABPBI.

Thermal degradation stability of all PBI / PA copolymers was measured in inert and air atmosphere; Unexpectedly all of them show very high thermal stability. One of these compounds (PBI / PA 85/15) shows ultrahigh values of 10% weight loss temp. (T_{d10}), 743 °C at max in N_2 and 689 °C at max in air. The PBI / PA films were cast over trifluoroacetic acid (TFA) solution on a glass plate. Mechanical properties for all those compounds were measured as the tensile strength of 90 MPa and Young's modulus of 7.7 GPa at maximum. All the PBI / PAs consisted of high crystallinity 41% at max. These values are as high as some of the metal oxides and being organic material with high thermal stability. Thus, the PBI / PA would be hopefully applied as organic-inorganic hybrid materials because of its ultrahigh heat resistance and chemical resistance properties.

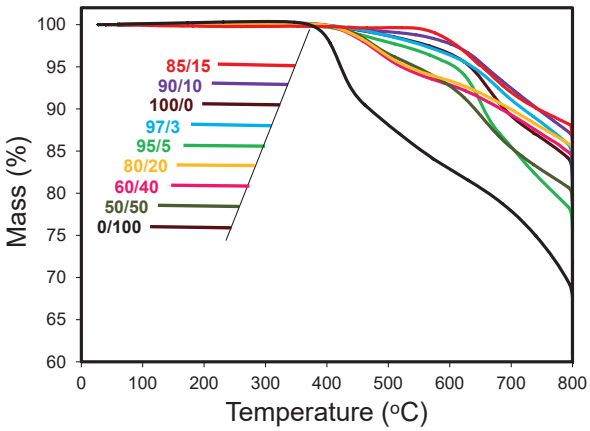

Figure: TGA plots for various copolymer combinations