The Synthesis and Characterization of New Thermoplastic Fire Resistant Materials

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Research Objective : Explore the utilization of the phenyl or methylphosphine oxide moiety on the fire resistance of ductile thermoplastic high performance materials.

Approach: The approach has been to synthesize either aromatic diamine monomers containing the phenylphosphine oxide structure for polyimides, or the activated aromatic halide containing the phenyl or methyl phosphine oxide connecting link for poly(arylene ether)s or poly(arylene sulfide)s**.**

ACCOMPLISHMENT DESCRIPTION: Two Ph.D. theses have been completed and several preliminary publications have been developed. Additional manuscripts are in press and some have been accepted for publication.

Significance: The aryl phosphine oxide structure is readily incorporated into engineering thermoplastic backbones in controlled concentrations. It is hydrolytically stable, but allows for the transformation into a very high char residue after burning. The formed char prevents ignition and detracts from the continued burning of a fire that has been initiated.

Expected Results: The thermoplastic poly(ether imide)s and thermoplastic poly(phenylene sulfide sulfone) copolymers had similar, if not better properties, than the control commercially available materials. They have provided equal or better reduced heat release rates relative to their commercial counterparts and in traditional tests they self-extinguish more rapidly.

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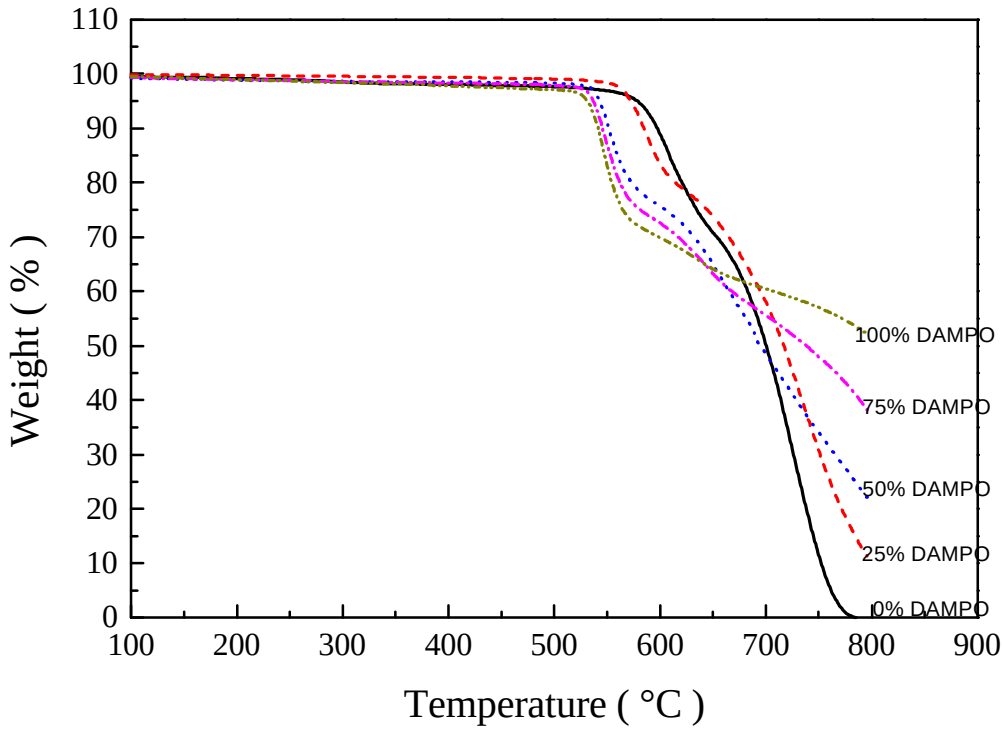

Dynamic TGA of DAMPO containing co-poly(ether imide)s (in air, 10°C/min.)