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Synthesis and thermal degradation characterization of novel poly(phosphazene-aryl amides)

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Abstract. New fully aromatic poly(phosphazene-aryl amides) were prepared by polycondensation reaction of our synthesized aromatic diamine: 1,1,3,5-tetraphenoxy-4,6-bis(4-aminophenoxy)oligocyclotriphosphazene (monomer **1**) with terephthaloyl dichloride. Their chemical structure and composition were characterized by elemental analysis, ^{1}H and ^{31}P NMR (Nuclear Magnetic Resonance), and FT-IR (Fourier transform infrared) spectroscopy, whereas their thermal degradation properties were determined by DSC (Differential Scanning Calorimetry) and TGA (Thermal Gravimertic Analysis) techniques. The solid residues of all samples were analysed by FT-IR and SEM (Scanning Electron Microscopy). Compared to conventional PPTA (poly(p-phenylene terephthamide)), PPAA (poly(phosphazene-aryl amide)) shows excellent thermal stability and solubility in polar protic solvents. All poly(phosphazene-aryl amides) show two thermal degradation in the temperature range 150–600°C. The monomer **1**, due to its structure, shows the first maximum rate of thermal decomposition temperature around 150–350°C, which may be due to the decomposition of the P–O–C bone. Morphology of the solid residues by Scanning Electron Microscope exhibit that the granular of the solid residues gradual disappearance with the increase of monomer **1** content. The surface layer of PPAA solid residues has been grumous, for the syneresis of P–O–P took place.

Keywords: *polymer composites, phosphazene, polyamide, thermal degradation*

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