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New Flame-Retardant Poly(ester-imide)s Containing Phosphine Oxide Moieties in the Main Chain: Synthesis and Properties

Khalil FAGHIHI

Department of Chemistry, Faculty of Science, Azad University of Arak, Arak-IRAN
Organic Polymer Chemistry Research Laboratory, Department of Chemistry,
Faculty of Science, Arak University, 38156, Arak-IRAN
e-mail: k-faghihi@araku.ac.ir

 [Keywords](#)
[Authors](#)



chem@tubitak.gov.tr

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Abstract: Six new flame-retardant poly(ester-imide)s (9a-f) with high inherent viscosity and containing phosphine oxide moieties in the main chain were synthesized from the polycondensation reaction of N,N-(3,3-diphenylphenyl phosphine oxide) bistrimellitamide diacid chloride (7) with 6 aromatic diols (8a-f) by 2 different methods:--solution and microwave-assisted polycondensation. The results showed that compared to solution polycondensation, the microwave-assisted polycondensation reaction using a domestic microwave oven proceeded rapidly and was completed within about 9-12 min. All of the obtained polymers were fully characterized by means of elemental analysis, viscosity measurement, solubility testing, and FT-IR spectroscopy. Thermal properties and flame retardant behavior of the PEIs (9a-f) were investigated by using thermal gravimetric analysis (TGA and DTG) and the limited oxygen index (LOI). Data obtained by thermal analysis (TGA and DTG) revealed that these poly(ester-imide)s had good thermal stability. Furthermore, high char yields in TGA and good LOI values indicated that incorporating phosphine oxide moieties in the polymer backbone markedly improved their flame retardancy. These polymers can be potentially utilized in flame retardant thermoplastic materials.

Key Words: Flame-retardant polymers, phosphine oxide moieties, N-(3,3-diphenylphenyl phosphine oxide) bistrimellitamide diacid chloride, aromatic diols.

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