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ABSTRACT: To overcome the poor compatibility, easy migration of additive flame retardants, a novel polyester polyol (DMOP) was synthesized from dimethyl methylphosphonate and diethanol amine through transesterification and used in the foaming formula to prepare inherent flame-retardant flexible polyurethane foams (FPUFs). DMOP mainly play soft segments in the foams which increases the flexibility and elongation at break. With a low incorporation amount of 10 php (ca. 6.3 wt%), the resultant FPUF can pass vertical burning test. More importantly, accelerated ageing tests at 140°C for 64 h indicate the persistent flame retardancy of DMOP for FPUF. The thermogravimetric analysis (TGA) results reveal their lower thermal stability than that of ordinary polyurethane. The corresponding flame-retardant mechanism of DMOP-containing FPUFs is investigated by Pyrolysis gas chromatography and mass spectrometry (Py-GC/MS) and FTIR, which indicates the phosphorus in DMOP mainly played their role in the vapor phase. This work thus offers a facile route for preparing FPUFs with persistent, efficient flame retardancy.

KEYWORDS: *polyol, flexible polyurethane foams, self-extinguishing, vapor phase*

1. Introduction

Production of polyurethane materials are over 18 million tons per year, making them the sixth largest synthetic materials on earth. About 40% of polyurethane raw materials are formulated into flexible polyurethane foams (FPUFs), which are predominantly used as cushioning materials in furniture, bedding, automobiles carpets, textiles and packaging [1-3]. Non-fire-retarded FPUFs are so flammable that upholstered furniture items always take the first ignited responsibility for most