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# 1 Fire hazard reduction of hollow glass microspheres in thermoplastic 2 polyurethane composites

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## 7 Abstract:

8 Nowadays, reducing the fire hazard of thermoplastic polyurethane (TPU) is an  
9 important research direction in the fields of fire safety materials. In this article, hollow  
10 glass microsphere (HGM) was used to reduce the fire hazard of TPU in combustion  
11 process. The fire characteristics including smoke and heat production of TPU  
12 composites were evaluated using smoke density test (SDT) and cone calorimeter test  
13 (CCT). And the thermal decomposition and flammable properties were further studied  
14 using thermogravimetric analysis/infrared spectrometry (TG-IR) and limiting oxygen  
15 index (LOI), etc. The SDT results showed that the luminous flux (LF) of TPU4  
16 containing 2.00 wt% HGM was up to 24% at the end of test without flame, which is  
17 much higher than that of TPU0 (5%). And, the CCT results indicated that 2.00 wt%  
18 HGM could make the total smoke release (TSR) decrease from 1019 m<sup>2</sup>/m<sup>2</sup> (TPU0) to  
19 757 m<sup>2</sup>/m<sup>2</sup> (TPU4), reduced by 26%. The TG-IR results confirmed that HGM could  
20 improve the thermal stability of composites and reduce the production of some toxic  
21 gases. The above results illustrated HGM had a good prospect in reducing the fire  
22 hazard for TPU.

23 **Keywords:** Fire hazard; Flame retardant; Thermoplastic polyurethane; Hollow glass  
24 microsphere

## 26 1. Introduction

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