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Study on the Preparation and Intumescent Flame Retardancy of Organic Modified Montmorillonite

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Abstract:
Keywords:

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Introduction

Linear low density polyethylene (LLDPE) is one of the most important polyolefins, but its inherent flammability has restricted its practical applications. Therefore, improving its flame retardancy has become very important. Recentlly, the addition of halogen-free flame retardant [1-3]. However, the high loading lead to the processing difficulties and poor mechanical properties of the materials.

Montmorillonite is a layered clay mineral composed of one octahedral layer between two silicon-oxide tetrahedral layers, which has many applications after surface modifications [4]. Synergistic flame retardants comprised of montmorillonite and other halogen-free flame retardant, such as magnesium hydroxide can give better flame retardant effect for LLDPE [5-6], but synergistic combinations of montmorillonite and intumescent flame retardant have not been reported.

In this study, firstly, organic modified layered silicate montmorillonite was prepared by solution intercalating with cetyltrimethylammonium bromide, which was verified by X-ray diffraction (XRD) (Fig. 1) and Fourier transform infrared spectroscopy (FTIR) (Fig. 2), secondly, modified montmorillonite was added to LLDPE with intumescent flame retardant, their flame retardant properties were measured and discussed by limiting oxygen index (LOI) and thermogravimetric analysis (TG). The results showed that montmorillonite can not only improve flame retardant effect, reduce the additive dosage of intumescent flame retardant, but increase the mechanic properties of LLDPE.

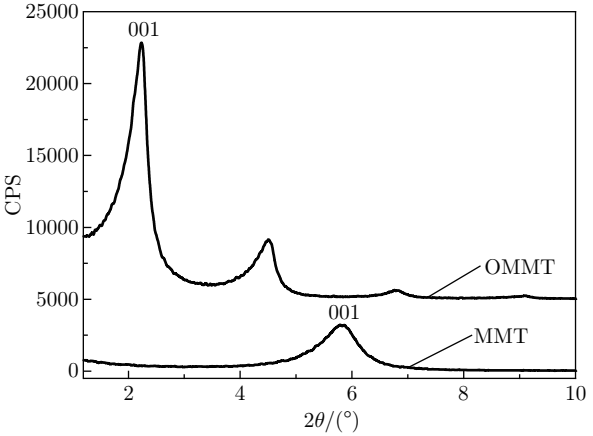

Fig. 1 The XRD patterns of MMT and OMMT

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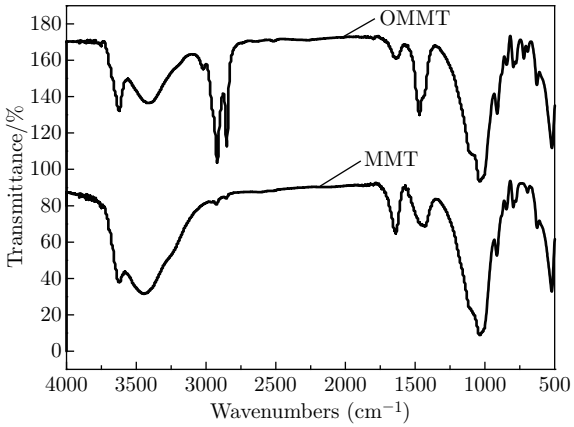

Fig. 2 FTIR spectrum of montmorillonite and organophilic montmorillonite

Table 1 The flame retardant property and mechanical propertyof LLDPE/IFR/OMT

LLDPE/ IFR/OMT	LOI(%)	Burning behaviour	Tensile Strength (MPa)
70/30/0	23.1	No dripping	8.48
70/30/1	23.7	No dripping	8.60
70/30/2	24.7	No dripping	9.16
70/30/3	24.6	No dripping	9.00
70/30/4	24.5	No dripping	8.71
70/30/5	24.1	No dripping	8.50

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