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Keywords [Amino Resin](#), [Nanocomposite](#), [Organ-Montmorillonite](#), [THPS](#)

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Study on the synthesis and application of THPS-OMMT-MDFP nanocomposite flame retardant

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Keywords: amino resin, Organ-montmorillonite, THPS, nanocomposite

Abstract. A new type of amino resin nanocomposite (THPS-OMMT-MDFP) was synthesized from amino resin (MDFP), Tetra-hydroxymethyl phosphonium sulfate (THPS) and Organ-montmorillonite (OMMT) by intercalation compounding method. It was characterized by FT-IR, XRD and TG/DTG and applied to the preparation of flame-retardant leather. The flame retardant performance was characterized by Oxygen index (OI) test. The results showed that the nanocomposite was obtained as expected and had effective flame retardant performance.

Introduction

At present, Leather has been widely used in all fields of life, especially for manufacturing fire prevention equipments because of its excellent breathability, adiabaticity, sweat resistance and wear resistance [1]. But leather is a product from collagen through the process of tanning, fatliquoring, dyeing and finishing. In these processes, compounds consisting of nitrogen, phosphorus, sulfur and halogen were introduced. At the same time, during the burning process, these compounds may produce smoke, toxic gases and corrosive gases [2]. Therefore, it is necessary to study a kind of special flame retardant materials that have the characteristic of high efficiency, non-toxicity, non-corrosive, durability and multi-function for leather. However, there are few researches on the flame retardant technology for leather presently in domestic.

The intumescent flame retardant (IFR) has become irresistible to researchers around the world in recent years owing to its adiabaticity, oxygen insulation, smoke-restraint, anti-molten drop and no corrosive gas produced [3]. With the development of IFR, the Polymer/Layered Silicate (PLS) nanocomposite flame retardant is considered as one of the most promising development directions for exploring new flame retardant materials and draws more and more attention. PLS used in leather not only failed to damage the nature properties of leather, but also it markedly improved the leather's properties such as fullness and softness [4]. Li Lixin et al [5,6] had successfully synthesized PLS nanocomposite which was applied to the preparation of flame-retardant leather. The results showed that it had effective flame retardant and retanning ability.

This paper mainly concerns the synthesis of a new intumescent amino resin flame-retardant (THPS-OMMT-MDFP) from amino resin (MDFP), Tetra-hydroxymethyl phosphonium sulfate (THPS) and Organ-montmorillonite (OMMT) by intercalation compounding method. The preparation technology, the optimization of the reaction conditions and the flame retardant performance of the nanocomposites are introduced in this paper.

Experiment

Sample preparation

Preparation of Organ-Montmorillonite (OMMT). Montmorillonite (CR) and distilled water were mixed in a three-neck flask at 70°C for swelling. Then cetyl trimethylammonium bromide (CTAB) was slowly added, and the mixture solution was stirred at 70°C for 3h. The solution was filtered after being cooled to room temperature; the solid residue was washed by ethanol until no chloride ion left in filtrate and dried at 105°C. The OMMT was obtained and its interlayer distance is 1.86nm (determined by XRD test).

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