摘　要

具有耐腐蚀性能、较好的力学性能、电绝缘性能的水性环氧树脂因为其不仅具有极强的适应能力，还对众多底材有强的附着力等优点应用广泛于涂料、电子、黏胶剂、建筑等领域。然而环氧树脂具有易燃性，这就使得环氧树脂的进一步应用受到了一定的限制，因此提高环氧树脂的阻燃性能成为当下的热点。传统的阻燃剂大多含有卤素原子，在燃烧时，不仅会有大量的烟雾生成，还会产生有毒的气体和具有腐蚀性的气体，这样既污染了环境，对人类健康也有一定的伤害。因此，制备出无污染，环境友好型的阻燃剂是现在阻燃领域的一大研究趋势。在本论文中，制备了一种新型高效环保的环氧树脂并取得的主要研究成果如下：

通过以聚乙烯亚胺（PEI）为固化剂，利用氯化亚锡中的 Sn^{2+}与聚乙烯亚胺中的胺基和海藻酸钠（SA）中的羧基的络合作用，制备了一种新型的本质阻燃环氧树脂。傅里叶红外光谱仪测试（FTIR）对海藻酸钠和 mSA 的结构进行表征，表明：Sn^{2+}取代了海藻酸钠中的 Na^{+}，与海藻酸钠的羧基发生络合作用，从而实现了过渡态金属离子阻燃的效果。热重分析测试（TGA）显示：所制得的样品（mSA/WEP）的分解温度比纯样（SA/WEP）的分解温度低，且样品（mSA/WEP）的残炭量比纯样（SA/WEP）的残炭量高，从而具有一定的阻燃效果。阻燃结果测试表明：可知当海藻酸钠/聚乙烯亚胺/水性环氧树脂/氯化亚锡的比例为 4:15:15:4 时，垂直燃烧通过 UL-94 V-2 级，氧指数为 23%，阻燃效果最佳。无缺口冲击强度测试：当海藻酸钠/聚乙烯亚胺/水性环氧树脂/氯化亚锡的比例为 4:15:15:4 时，所制得的样品的力学强度最好，力学强度达到 1.44kJ/m^2.

关键词：环氧树脂；氯化亚锡；阻燃；聚乙烯亚胺

Abstract

Water-based epoxy resin with corrosion resistance, good mechanical properties and electrical insulation properties is widely used in coatings, electronics and adhesives because it not only has strong adaptability, but also has strong adhesion to many substrates. Agents, construction and other fields. However, epoxy resin is flammable, which makes the further application of epoxy resin limited, so improving the flame retardant properties of epoxy resin has become a hot spot. Most of the traditional flame retardants contain halogen atoms. When burning, not only a large amount of smoke is generated, but also toxic gases and corrosive gases are generated, which pollutes the environment and causes certain harm to human health. Therefore, the preparation of a non-polluting, environmentally friendly flame retardant is a major research trend in the field of flame retardant. In this paper, a new type of highly efficient and environmentally friendly epoxy resin was prepared and the main research results were as follows:

A novel type was prepared by using polyethyleneimine (PEI) as a curing agent and utilizing the complexation of Sn2+ in stannous chloride with the amine group in polyethyleneimine and carboxyl group in sodium alginate (SA). The essence of flame retardant epoxy resin. The structure of sodium alginate and mSA was characterized by Fourier transform infrared spectroscopy (FTIR), which indicated that Sn2+ replaced Na+ in sodium alginate and complexed with the carboxyl group of sodium alginate to realize transition metal ions. Flame retardant effect. Thermogravimetric analysis (TGA) showed that the decomposition temperature of the prepared sample (mSA/WEP) was lower than that of the pure sample (SA/WEP), and the amount of carbon residue in the sample (mSA/WEP) It has a higher amount of carbon residue than the pure sample (SA/WEP) and thus has a certain flame retardant effect. The flame retardant test showed that when the ratio of sodium alginate/polyethyleneimine/aqueous epoxy resin/stannous chloride was 4:15:15:4, vertical combustion passed UL-94 V-2 grade, oxygen The index is 23% and the flame retardant effect is the best. Unnotched impact strength test: When the ratio of sodium alginate/polyethyleneimine/aqueous epoxy resin/stannous chloride is

4:15:15:4, the prepared sample has the best mechanical strength and mechanical

strength. It reached 1.44kJ/m^2.

Key words: epoxy resin; stannous chloride; flame retardant; polyethyleneimine