蓖麻油改性水性聚氨酯的制备及性能研究

题　　目：蓖麻油改性水性聚氨酯的制备及性能研究

摘　要

水性聚氨酯作为一种新型聚氨酯，继承了聚氨酯优异性能的同时，又能大大减少有机溶剂的使用，是一种绿色环保的合成材料，因此受到各界广泛关注，并被应用于建筑涂料，木器涂料，及织物皮革涂饰等领域。近年来人们发现水性聚氨酯具有作为水性阻尼涂料的潜力，但需实现其耐水性、力学性能、低温阻尼性能的提升。

本文以异佛尔酮二异氰酸酯（IPDI）、聚四氢呋喃二醇（PTMG）为主要反应单体合成了水性聚氨酯分散体。通过蓖麻油（CO）的引入，对聚氨酯的内部结构进行改性，并对其胶膜的耐水性、力学性能、阻尼性能以及其它性能进行研究。

研究 CO 引入对 WPU 的影响时，制备了一系列固含量为 34%左右的 WPU 分散体，发现该系列乳液拥有适中的粒径和较小的粘度，其粒径范围为 110-180 nm，粘度在 14.47-22.98 mPa.s 范围。随 CO 含量的增加，聚氨酯胶膜的耐水性和透光率逐渐下降，但断裂伸长率大幅提升至 1626.25%，热稳定性也得到了一定的提高。且有效阻尼初始温度向低温移动由 0.68℃降低至 -42.30℃，具有低温阻尼涂料领域的应用前景。

关键词： 水性聚氨酯　蓖麻油　水性阻尼涂料　热稳定性

Abstract

Waterborne polyurethane as a new eco-friendly material with high performance and low volatile organic compound (VOC) content has attracted extensive concerns. It has been widely used in building coating, wood coating, leather, textile and adhesive, etc. As a potential application in damping coating, waterborne polyurethane has its inherent disadvantages such as poor water resistance, mechanical properties and low-temperature damping properties.

In this study, waterborne polyurethane hybrid emulsions were synthesized by the reaction of isophorone diisocyanate and polytetramethylene ether glycol as main raw materials. Series of WPUs with different structure were obtained by introduction of castor oil. The water resistance, mechanical and damping properties of WPU films were investigated. The introduction of CO on the properties of WPU were studied. Stable emulsions with particle size ranging from 110 nm to 180 nm, viscosity ranging from 14.47-22.98 mPa.s and solid content about 34% were obtained. With the increase of CO content, a decrease of water resistance and transparency of WPU films was found. While an improvement of tensile elongation at break about 1626.25% and improved thermostability were obtained. As to the damping properties of WPU, a decrease of effective Initial damping temperature from 0.68℃ down to -42.30℃ were observed.

An effective Initial damping temperature moved to a lower temperature -43.30℃，which have potential application prospects in low-temperature damping coating.

Key words: Waterborne polyurethane Castor oil Low-temperature damping coating Thermostability