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硕 士 学 位 论 文

二元酸单酯稀土热稳定剂的  
制备和热稳定性研究

Studies on Preparation and Thermal Stability  
of Dual-acid Ester Rare-earth Thermal  
Stabilizer

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*Studies on Preparation and Thermal Stability of Dual-acid Ester*

*Rare-earth Thermal Stabilizer*



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## 摘 要

热稳定剂是聚氯乙烯树脂加工的必要助剂，目前热稳定剂分别存在毒性高、稳定效率低或价格昂贵等缺点。研究制备无毒、高效以及加工性能良好的稀土热稳定剂符合环保的产业要求，具有实际应用价值。

本文首次通过两步法制备三（二元酸单酯）镧。首先采用二元酸（或酸酐）与醇通过控制反应制备二元酸单酯，接着在小分子有机酸催化剂作用下由二元酸单酯和氧化镧直接反应生成三（二元酸单酯）镧。分别考察了三种二元酸（或酸酐）与六种醇生成二元酸的系列单酯的制备条件对单酯化产率的影响，确定较优的制备条件。结果表明制备出的单酯产率均大于83%，其中以2.5g 419-a为催化剂，在温度为90℃，反应2.5h，马来酸单丁酯的产率可达98%。进一步研究不同的二元酸单酯与氧化镧的反应过程，探讨反应温度、反应时间和催化剂用量等因素对三（二元酸单酯）镧的产率的影响，得出最佳的制备工艺为：以419-b为催化剂，在130℃反应2h，制备出的三（二元酸单酯）镧中以三（己二酸单酯）镧的产率最高为95%，三（邻苯二甲酸单环己酯）镧的产率最低为74%。

采用热烘箱法和刚果红法分别对三（二元酸单酯）镧及其复配热稳定剂进行热稳定性测试。结果表明三（马来酸单苯甲酯）镧的热稳定效果最好，初期着色时间为15min，比钙锌复合热稳定剂多5min和有机锡一样，刚果红时间为39min，是钙锌复合热稳定剂的2.5倍且长于有机锡。三（二元酸单酯）镧的高效热稳定效率是由于镧具有多配位结构，单酯酸结构提高了热稳定剂与PVC的相容性。

**关键词：** PVC ； 热稳定剂； 三(二元酸单酯) 镧

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## ABSTRACT

Thermal stabilizer is a necessary auxiliaries of PVC processing. At present, thermal stabilizer respectively has high toxicity, low efficiency or high prices and other shortcomings. Study on non-toxic, high efficiency, processing performance and good thermal stability of the rare earth comply with environmental protection of the industry with practical application value.

In this paper, the first time use the two-step synthesis of (the dual acid monoester) La. First, use of the dual acid (or anhydride) and alcohol by controlling the response of the dual acid monoester. Then under the small molecule organic acid catalyze by the dual acid monoester and La oxide direct reaction of the (dual acid monoester) La. Respectively inspected the three dual acid (or anhydride) and six alcohol generated a series of dual acid monoester Acid conditions on the single-monoesterification yield of the impact of determining the appropriate conditions. The results showed that in this series of experiments under the conditions of the single acid monoester Production rate of greater than 83 percent, of which the Malay-butyl acid production rate up to 98 percent. Further study in the reaction of different dual acid monoester and La oxide. Discussion on the reaction temperature, reaction time and the amount of catalyst, and other factors on the impaction of the (dual-acid monoester) La. Draw the best synthetic process, use 419-b as a catalyst and in the 130°C reaction for 2 hours. Series three (Binary acid monoester) La, three (single-adipic acid monoester) La yield a maximum of 95 percent, three (single cyclohexyl phthalate monoester) La yield a minimum of 74 percent .

Oven ageing test and congo red test was respectively used in the series (the dual acid monoester) La, compound of a thermal stable thermal stability test. The result showed that (Maleic acid methyl benzene) La has the best effect thermal stability, Coloring the early timing of 15 mins, 5 mins more than calcium zinc composite thermal stability and the same as organic tin. Congo red time 39 min, is 2.5 times than the thermal-stable calcium compound of zinc and longer than organic tin. (Binary acid monoester) La of highly efficient thermal stability is due to the efficiency of multi La

coordination structure. Monoester acid structure for improved thermal stability and the compatibility of PVC.

Key words : PVC; Thermal stability; (Binary acid monoester) La

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