题　　目：甲壳素液化物/茶多酚/聚乙烯醇
共混膜的制备及其性能研究

摘　　要

甲壳素是自然界中含量仅次于木质纤维素的第二大生物质资源，它能从虾、蟹等海产品以及昆虫等途径获取。本文通过液化将高分子量的甲壳素转化为低分子量的液化物，同时还能达到脱乙酰的作用。聚乙烯醇(PVA)和液化球磨甲壳素(LBMC)制备的共混膜具有优异的生物降解性和力学性能，但抗氧化性不高。抗氧化活性包装材料作为食品包装材料的研究热点，它是通过向材料中添加的抗氧化剂制备得到的，要求添加的抗氧化剂既要保证薄膜的抗氧化能力又要对人体无害。抗氧化剂茶多酚(TP)是从茶树中提取的天然抗氧化剂，不仅具有良好的生物降解性和生物相容性，同时还可以预防癌症、心血管疾病和糖尿病等优点。本文将抗氧化剂茶多酚加入甲壳素液化物/聚乙烯醇共混膜中，研究其对共混膜性能的影响。

将不同比例的 TP（0%，1%，2%，3%，4%，5%）加入到聚乙烯醇(PVA)和液化球磨甲壳素(LBMC)混合溶液中，以流延法制备抗氧化共混膜。采用傅里叶红外光谱（FTIR）、扫描电子显微镜（SEM）和热重分析（TG）研究共混膜的结构和热稳定性，并对其力学性能、水溶性和抗氧化性进行测试。研究结果表明：

TP 的加入会与 PVA 和 LBMC 产生新氢键相互作用。随着 TP 的加入，材料微观结构先变紧密再到疏松。当 TP 添加量为 2%

时，共混膜具有最佳的热稳定性、力学性能和耐水性。共混膜中 TP 含量由 0%增加到 5%时，DPPH 自由基清除率由 50.35±0.33%增加到 70.17±0.5%。与未加入茶多酚的共混膜相比，茶多酚的加入使得共混膜的抗氧化活性明显提高。

关键词：甲壳素；液化；抗氧化；茶多酚

Abstract

Chitin is the second largest biomass resource in nature after lignocellulose, which can be obtained from shrimp, crabs and other seafood as well as insects. In this paper, the high molecular weight chitin was converted to the low by liquefaction, and the deacetylation was also achieved. The blend film prepared by PVA and LBMC has excellent biodegradability and mechanical properties, but has low oxidation resistance. As a research hotspot of food packaging materials, antioxidant active packaging materials are prepared by adding antioxidants to the materials, which are required to ensure the antioxidant capacity of the film and harmless to human body. Antioxidant tea polyphenols (TP) is a natural antioxidant extracted from tea trees, which not only has good biodegradability and biocompatibility, but also can prevent cancer, cardiovascular disease and diabetes.

Different proportions of TP (0%, 1%, 2%, 3%, 4%, 5wt%) were added to the mixed solution of polyvinyl alcohol (PVA) and liquefied ball-milled chitin (LBMC). Fourier infrared spectroscopy (FTIR), scanning electron microscopy (SEM) and thermogravimetric analysis (TG) were used to study the structure and thermal stability of the blend film. Furthermore, the mechanical properties, and antioxidant properties were systematically tested. The results show that:

The addition of TP results in new hydrogen bond interactions with PVA and LBMC. With the addition of TP, the microstructure of the material first becomes compact and then loose. When TP content is 2%, the blend film has the best, mechanical properties, water resistance and thermal stability. While the TP content in the blend film increases from 0% to 5%, DPPH radical clearance rate increased from 50.35±0.33% to 70.17±0.5%. Compared with the blend film without tea polyphenols, the antioxidant activity of the blend film increased obviously with the addition of tea polyphenols.

Key words: chitin；liquefaction；antioxidant；tea polyphenols