高雾度及紫外屏蔽的橡仁粉/卡拉胶基可胶&热封的油脂包装膜的制备及性能研究

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摘 要：塑料的大量使用造成了白色污染，使生态环境被严重破坏。治理和消除白色污染已成为全球的共同目标。因此，研制出可生物降解的包装薄膜材料迫在眉睫。天然聚合物，如多糖和蛋白质，可用来生产包装膜并具有代替合成聚合物的潜力。目前，已有很多比传统塑料包装膜具有更好的阻隔性、抗菌性或抗氧化性的多糖基薄膜被研制出来。但由于多糖的熔融温度高于热解温度导致其无法通过热封形成有效地包装袋，难于实际应用。淀粉和蛋白质衍生的薄膜可热封并用作塑料的替代品。然而，这种利用方式可能会加剧全球粮食短缺。本研究中，我们利用废弃的橡子与卡拉胶制备了可胶&热封的复合包装膜。测试了橡仁粉/κ-卡拉胶（AKM/κC）复合膜的机械强度，热稳定性，透光率，雾度和抗菌性能。结果表明，当甘油从 30%增加到 50%时，雾度和透光率分别从 96.74%和 3.50%下降到 94.50%和 2.25%。AKM/κC 薄膜具有优异的紫外线屏蔽性能（380-200 nm 处的透过率为 0）。使用 15g/L 的壳聚糖季铵盐（CQAS）作为生物胶水对 45g-AKM/κC 薄膜进行胶&热封。在 115 ºC，0.3MPa 下热封 1s 的密封强度最大，为 5.09±0.29N/15mm。用 45g-AKM/κC 包装的牛油在 25 ºC 贮存 75 天后，过氧化值（POV）从 0.0187 g/100g 增加到 0.0336 g/100g，低于暴露在空气中的牛油的 POV（0.5209 g/100g，已变质）。我们制备的薄膜具有较高的雾度和紫外线屏蔽性能，可用作富含脂肪食品的塑料包装替代品。

关键词：橡仁粉；κ-卡拉胶；复合膜；高雾度；紫外屏蔽；可密封

Fabrication and characterization of a glue- and heat- sealable acorn kernel meal/κ-carrageenan composite film with high-haze and UV-shield for packaging grease

Abstract: The extensive utilization of plastics has resulted in the emergence of white pollution, which poses a severe threat to the ecological environment. Consequently, tackling and eradicating this issue has become a shared objective worldwide. Therefore, it is imperative to expedite the development of biodegradable packaging film materials. Natural polymers, such as polysaccharides and proteins, possess the potential to replace synthetic polymers in producing packaging films. Numerous polysaccharide-based films have been developed with better barrier, antimicrobial or antioxidant properties compared to traditional plastic packaging films. However, their practical application is limited due to they pyrolze before melting which hinders heat-sealing for effective bag formation. Starch- and protein-based films are viable substitutes for plastics, as they can be heat-sealed. However, the utilization of starches and proteins in this way may exacerbate global food shortages. In this study, we used discarded acorns to prepare a glue- and heat-sealable packaging film. We evaluated the mechanical characteristics, thermal stability, transmission, haze, and antimicrobial properties of an acorn kernel meal/κ-carrageenan (AKM/κC)

composite film. The results showed that the haze and transmittance decreased from 96.74% to 94.50% and from 3.50 to 2.25%, respectively, when glycerol increased from 30% to 50%. The AKM/κC film had excellent UV shielding properties (transmittance at 380-200 nm was 0). The 45 g-AKM/κC films were sealed through a comnination of bio-glue composed of 15 g/L chitosan quaternary ammonium salt (CQAS) and heat at 115 ^{o}C for 1 s under a pressure of 0.3 MPa, resulting in a maximum sealing strength of 5.09 ± 0.29 N/15 mm. Beef tallow packaged in 45g-AKM/κC exhibited an increased peroxide value (POV) from 0.0187 to 0.0336 g/100 g after 75 days of storage at 25 oC, which was lower than that in air (0.5209 g/100g, which has deteriorated). Our developed film had high haze and UV shielding performance and can be used as a plastic packaging substitute for fat-rich foods.

Key words: acorn kernel meal; κ-Carrageenan; composite film; high-haze; UV-shield; sealability.