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机械活化醋酸酯淀粉的制备及其生物降解塑料膜性能

Preparation of mechanical activated starch acetate and performance research of the biodegradable plastic films

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中文摘要:

为了有效提高淀粉基生物降解塑料的性能，本试验对机械活化1.0 h的玉米淀粉（MAS）进行酯化改性，制备了机械活化醋酸酯淀粉（MASA）及机械活化醋酸酯淀粉/聚乙烯醇的生物降解塑料膜（MASA/PVA），用傅立叶红外光谱仪（FTIR）、差示扫描量热仪（DSC）、扫描电镜（SEM）分别对MASA的结构、热稳定性、形貌等进行测试和表征，并与原醋酸酯淀粉/聚乙烯醇生物降解塑料膜（SA/PVA）对比研究了塑料膜的力学性能和生物降解性能。结果表明，机械活化淀粉经酯化改性后，结构和形貌都有很大的改变，热性能提高；MASA/PVA塑料膜的性能均比SA/PVA好，以机械活化醋酸酯淀粉（DS=0.1）为原料制备的MASA/PVA塑料膜浸水前的拉伸强度为3.56 MPa，断裂伸长率146.22%，24 h吸水率为134.79%，抗热水性能好，在20 d内该塑料膜土埋生物降解率为45.90%。机械活化预处理有效改善了生物降解塑料膜的性能。

英文摘要:

In order to improve properties of starch-based biodegradable plastic films, the mechanical activated starch acetate (MASA) was synthesized from mechanical activated maize starch (MAS) with activation time for 1.0 h. At the same time, the biodegradable plastic films were produced by thermal gelatinization of starch suspensions blending MASA with degree of substitution and polyvinyl alcohol (PVA). By Fourier transform infrared spectrogram (FTIR), differential scanning calorimetry (DSC) and scanning electron microscopy (SEM), the microstructure, particle shape, thermal stability were studied. The mechanical properties and biodegrade ability of the MASA/PVA were investigated by comparing with those of native starch acetate (SA). The results indicated that the microstructure and particle shape changed greatly and thermal property of MASA increased compared with those of MAS and native starch. The properties of MASA/PVA were better than those of SA/PVA, and the tensile strength of the MASA/PVA with MASA (DS=0.1) was 3.56 MPa, the breaking elongation was 146.22% before soaking in water, and the absorption of water was 134.79% after 24 h. Hot water resistance properties was good, and the rate of biodegradation was 45.90% in the soil after 20 days. The mechanical activation pretreatment effectively improved the properties of biodegradable plastic films.

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