

## 论文

### 新型热塑性淀粉的制备和性能

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#### 摘要:

以二甲基亚砷(DMSO)为增塑剂, 通过熔融共混法制备了一种新型热塑性淀粉(TPS), 研究不同增塑剂含量对材料结构和性能的影响, 并与甘油及甘油/水复合增塑淀粉体系进行了比较. FTIR结果显示, DMSO能够与淀粉产生强烈而稳定的氢键相互作用. WAXD和SEM的研究结果表明, DMSO的加入破坏了淀粉的有序结构, 实现了淀粉的塑化, 形成均一的非晶连续相. 同甘油及甘油/水增塑体系相比, DMSO与淀粉的羟基形成更为稳定的氢键, 能够有效抑制淀粉的重结晶. 动态力学和拉伸力学性能测试结果表明, 经过DMSO的增塑, 有效降低了淀粉的玻璃化转变温度, 改善了材料的韧性, 增塑效率要好于甘油及甘油/水复合增塑体系.

关键词: 热塑性淀粉; 二甲基亚砷; 氢键

### Preparation and Characterization of a Novel Thermoplastic Starch Using Dimethyl Sulfoxide as the Plasticizer

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#### Abstract:

A novel thermoplastic starch was prepared by melting processing method using dimethyl sulfoxide (DMSO) as a plasticizer. The effect of the plasticizer was investigated by a combination of FTIR, XRD, SEM, DMA and tensile testing techniques, and was compared with the more conventional plasticizers, glycerol and glycerol/water. FTIR analysis show that DMSO act as a hydrogen bond acceptor and can form stable hydrogen bonds with starch. XRD and SEM results indicate that the crystalline of starch is destructed and the starch granules transferred to a continuous amorphous phase. It was found that the DMSO could more effectively restrain the retrogradation than the plasticizers, glycerol and glycerol/water, due to the stronger hydrogen bonds. The mechanical analysis showed that the effect of the DMSO was better than glycerol and glycerol/water.

Keywords: Thermoplastic starch; Dimethyl sulfoxide(DMSO); Hydrogen bond

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