Preparation and characterization of biodegradable food packaging films containing cellulose and zein

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ABSTRACT

Development and use of biodegradable food packaging films insubstitution of petroleum plastic films is an urgent issue attracting theworldwide concern based on the consideration of environmental protec-tion.In general, cellulose-based films are hydrophilic and hygroscopic, whilezein films are hydrophobic and fragile. In this study, a goal was pursued tocombine the beneficial properties of cellulose and zein to comprise asuitable formulation to prepare biodegradable packaging films.Hydroxylpropyl me thyl cellulose （ HPMC ）, methyl cellulose （ MC ） andzein were used. The plasticizer effect of polyethylene glycol （ PEG ） wasintensively investigated. A dynamic mechanical analyzer （ DMA ） wasmonitored to analyze the mechanical properties of the prepared films.Elongation （ or strain ）, toughness and tensile strength （ or stress ） of HPMC and HPMC/MC films decreased while hardness （ modulus ） increasedwith the increase of zein concentration. On the same basis of zeinconcentration, elongation and hardness of H PMC/MC films are higher thanHPMC films while tan d of HPMC/MC films increased with the increase of zeinconcentration. In comparison, HPMC films were more elastic than HPMC/MCfilms. As a general trend, both HPMC and HPMC/MC films increased theirhard-ness and brittleness as zein concentraion increased. When PEG wasadded, elongation of HPMC and HPMC/MC films increased while hardnessdecreased with increase of PEG addition. The toughness of HPMC films alsoincreased as the concentration of the added PEG in -creased. Tan d and Tg ofHPMC and HPMC/MC films decreased with increase of PEG addition and thisindicates that elasticity of the films increased with increase of PEGaddition. Water vapor permeability （ WVP ） of HPMC and HPMC/MC filmsdecreased as the concentration of zein increased. On the same basis of zeinconcentration, WVP of HPMC films decreased with an increase of PEG addition.When PEG was added at 1.0 % for HPMC/MC films, the lowest WVP was obtained.In the aspect of oxygen barrier of the films in relation to peanut oiloxi-dation, oxidation retardation of the HPMC and HPMC/MC films in-creasedwith increase of zein concentration. When PEG was added, the most effectiveoxygen barrier in prevention of oil oxidation was ob-tained at 1.0 % PEG forHPMC films containing 2.0 % zein and 0.5 % PEG for HPMC/MC films containing1.0 % zein.

Keywords : 甲基纖維 ; 玉米蛋白 ; 羥丙基甲基纖維

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