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Macro, micro and molecular characterizations of microcrystalline cellulose and hydrocolloid composite films

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Hydrocolloids are film forming bio-based and edible materials containing wide varieties of properties. The present study investigated the macro-, micro- and molecular properties of several hydrocolloid composite films namely agar-agar (AGAR), hydroxyl propyl methyl cellulose (HPMC), propylene glycol alginate (PGA), and microcrystalline cellulose gum (MCG). Several ratios of AGAR, HPMC and PGA were mixed with MCG and determined for their tensile and surface properties, water vapor transmission rate (WVTR), light transmission and microstructure using scanning electron microscopy (SEM). The molecular structure was determined using an attenuated total reflectance infrared spectroscopy (ATR-FTIR). The results showed that incorporation of MCG decreased light transmission, elongation and smoothness of the films due to an increased crystalline components. However, the incorporated MCG reduced tensile strength in all films possibly due to the interrupted polymer network by crystalline particles. The WVTR values of the films were in the order of HPMC>MCG>PGA>AGAR. The increased surface hydrophobicity of hydrocolloid composites correlated well with a decreased WVTR values; however, a diverse correlation was found for pure MCG films. The ATR-FTIR revealed an interaction between MCG and HPMC components via hydrogen bonding contributed to an improved water barrier properties and miscibility of microstructure. Conversely, the SEM revealed a phase separation between AGAR and MCG coincident with a decreased water vapor barrier. The PGA-MCG composite films showed a dense matrix with an identical WVTR and surface hydrophobicity. The mixing of hydrocolloid components effectively modified properties, micro- and molecular structures for desired characteristics of bio-based films.

Biography

Nathdanai Harnkarnsujarit has completed his PhD from Department of Food Science and Technology, Kasetsart University, Thailand and Post-doctoral studies from Department of Food Science and Technology, Japan. He is currently working as a Lecturer at the Department of Packaging and Materials Technology Kasetsart University, Thailand. He has published several papers in reputed journals and has been serving as an Associate Editorial Board Member of the Journal of the Science of Food and Agriculture.

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