Food Research International 100 (2017) 612–622

Contents lists available at ScienceDirect

Food Research International

journal homepage: www.elsevier.com/locate/foodres

Development and characterization of a new encapsulating agent from orange juice by-products

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ARTICLE INFO

Keywords:
Encapsulation
Fibers
Glass transition
Isosteric heat
Orange wastes
Sorption isotherm

ABSTRACT

The replacement of maltodextrins as carriers for the spray drying of sticky and sugar based bioactives is an important development for the food industry. In this work, orange juice industry by-product was used to obtain a high dietary fiber powder to be used as carrier material. This powder was characterized with respect to its physical and chemical properties related to the process of encapsulation by spray drying. Adsorption isotherms of orange waste powder were determined at 30, 45, and 60 °C. The data were fitted to several models including two-parameter (BET, Halsey, Smith, and Oswin), three-parameter (GAB), and four-parameter (Peleg) relationships. The GAB model best fitted the experimental data. The isosteric heat of sorption was determined from the equilibrium sorption data using the Clausius-Clapeyron equation. Isosteric heats of sorption were found to decrease exponentially with increasing moisture content. The enthalpy-entropy compensation theory was applied to the sorption isotherms and indicated an enthalpy controlled sorption process. Glass transition temperatures (T_g) of orange waste powder conditioned at various water activities were determined and a strong plasticizing effect of water on T_g was found. These data were satisfactory correlated by the Gordon and Taylor model. The critical water activity and moisture content for the orange waste powder were 0.82 and 0.18 g water/g solids, respectively, at a storage temperature of 25 °C.