554f Wettability of Wax Particles Modified by Food Emulsifiers

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Modification of wettability of particles is important in a variety of food applications. In many instances, the food particle wettability is very poor due to its high surface hydrophobicity. Wax particles were used as model system in this study. Contact angle of a planar wax surface (obtained by coating a glass slide) was characterized by viewing a 2mm diameter water droplet with a Ramehart 50-00 contact angle meter. Surface pressure-area isotherm of wax particles at air-water interface was obtained using Langmuir trough, from which contact angle of the particles at the air-water interface was calculated using Clint and Taylor's model. The contact angles from the two techniques agreed very well, suggesting that the contact angle of a planar surface is similar to that of particles at air-liquid interface. The wax surface was modified by exposing it to surfactant solution of different concentrations (0.01 to 1%) overnight followed by drying. Screening experiments were conducted to evaluate the efficiency of different surfactants (Tween 20, 40, 60, 80 and whey protein) in reducing the contact angle of wax surface. Contact angle decreased from the control value of around 100 degrees to values in the range of 10 to 70 degrees with an increase in the surfactant conecentration Whey protein was found to be most efficient among the emulsifiers investigated. Effect of pH on the contact angle was investigated for whey protein solution and Tween-20 respectively using 5% citric acid buffer. The contact angle was found to be high (around 70 degrees) at pH 2.5 and lower and decreased dramatically to around 10 degrees for pH 4.5 and above in the presence of 0.05% whey protein. pH in the range of 2~7 did not show significant effect on contact angle of Tween-20, with the contact angle values of around 50 degrees. At the whey protein concentration of 0.5%, contact angle decreased from around 70 degrees without the addition of salt to around 10 degrees in the presence of 0.5 M NaCl. Dispersibility of wax coated particles in aqueous solution was characterized by the measurement of bulk particle concentration upon suspension. Particles were not wetted by the buffer solution and therefore reside at the air-water interface. Whey protein in the presence of 0.5 M NaCl in 5% citric buffer showed much higher wettability compared to 0.1% whey protein solution with 0.5M NaCl and Tween-20 solution.