

# **Microencapsulation of soybean oil with maltodextrin and sugar beet pectin by spray drying with a three-fluid nozzle**

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## **Abstract**

In this study, the effect of the rheological properties of the wall material on the properties of spray-dried microcapsules using a three-fluid nozzle (3FN) was evaluated. Soybean oil was encapsulated with various concentrations of maltodextrin (10 and 20%, w/w) and sugar beet pectin (0.5, 1, 2, 3, and 4%, w/w) mixture via spray drying with a 3FN. The rheological properties of the feed wall material were measured using a controlled stress rheometer before spray drying. Morphology, internal structure, particle size distribution, flowability, color, surface oil content, and encapsulation efficiency of spray-dried microcapsules were evaluated. The rheological properties of the wall material solution fit the Power-Law model. At the same maltodextrin concentration, when increasing the pectin concentration, consistency index increased and flow behavior index decreased which indicated more shear-thinning behavior. The rheological properties of wall material had a limited impact on the morphology and internal structure, that most spray-dried samples had a wrinkled surface with some microcapsules having a spherical shape with a hollow core. As the viscosity of the wall material solution increased, the particle size distribution of microcapsules became wider. The brightness of microcapsules decreased when increasing the pectin concentration as the yellowness increased. The spray-dried powder was showed poor flowability due to the small particle size (10 to 20  $\mu\text{m}$ ). The surface oil content of microcapsules was between 1.32 to 3.41%, which increased as increasing the viscosity of the wall material. The encapsulation efficiency was between 74.66 to 91.17%. This study investigated the relationship between wall material properties and the properties of spray-dried microcapsules, which can be used to expand the application of 3FN in the food industry.