Oxidative stability and physical characteristics of oil microcapsules by coaxial nozzle

Muriel Jacquot, Elmira Arab Tehany, Claire Gaiani, Michel Linder
ENSAIA-INPL, LSGA, 2 avenue de la Forêt de Haye, F-54500 Vandoeuvre lès Nancy, France
Tel. +33 (0)3.83.59.58.49

Fish oil is known to be a rich source of long chain polyunsaturated fatty acids of the omega-3 (n-3) family. The fish are a unique source of omega-3 especially long-chain docosahexaenoic acid (DHA, C22:6n-3) and eicosapentaenoic acid (EPA, C20:5n-3) (PUFA). Additionally DHA is essential for the development of brain, mammalian nervous system, vision in fetus and infants. Docosahexaenoic acid (DHA, C22:6n-3) plays a role in the prevention of a number of disease in humans, including cardiovascular disease, inflammation, and cancer. Utilization of oils high in omega-3 fatty acids in food is limited due to their susceptibility to oxidation. Encapsulation can protect polyunsaturated fatty acid (PUFA) from light and heat damage, and suppress or retard the oxidation of PUFA.

Food industry can employ several biodegradable polymer based edible films that could potentially serve as coating materials. Among them, polysaccharide polymer such as Hydroxypropylmethylcellulose (HPMC) has been studied. HPMC is used in the food industry as an emulsifier, film former, protective colloid, stabilizer, suspending agent and edible film.

Aim of the present study was to investigate the physico-chemical properties of microcapsules with 75% of HPMC and 25% of alginate leads to an increase in oxdidative stability of encapsulated fish oil. The production of double-walled microspheres required careful selection of solvent and polymer concentration to encourage droplet phase separation into a core/shell structure.

We report an extension of particle fabrication technology for the production of monodisperse microcapsules. The core/shell droplets were produced from fish oil/HPMC+alginate by utilizing two coaxial nozzles. The volumetric flow-rates for core is 15ml/s and for shell is 1ml/min. Fabrication conditions were investigated to control shell thickness, uniformity of thickness and the core diameter. Diameter of particular is between 1 and 1.5 mm. The encapsulation efficiency of oil was ~97%.