Supakchon Klongdee 2010: Effect of Chitosan on Stability, Microstructure and Rheological Property of Tuna Oil Emulsion Stabilized by Lecithin. Master of Science (Food Science), Major Field: Food Science, Department of Food Science and Technology. Thesis Advisor: Ms.Utai Klinkesorn, Ph.D. 131 pages.

The purpose of these experiments was to determine the influence of chitosan on stability, physical and rheological properties of lecithin-stabilized tuna oil emulsion. A lecithin-stabilized emulsion (primary emulsion) was prepared by homogenizing 15 wt% tuna oil and 3 wt% lecithin in acetate buffer (pH 3). Chitosan solutions with different molecular weights (low molecular weight (LMW); 120 ± 98 kDa, medium molecular weight (MMW); 250 ± 60 kDa and high molecular weight (HMW); 342.5 ± 45 kDa) were added to produce secondary emulsions with final composition of 5 wt% tuna oil, 1 wt% lecithin and 0-0.25 wt% chitosan. The effects of chitosan concentrations and molecular weights on the properties of emulsion were investigated by evaluating the electrical charge (ζ-potential), particle size, microstructure and rheological property of emulsion. The ζ-potential of lecithin stabilized droplets in the emulsion changed from negative to positive when chitosan was added to the emulsion. This result suggests that cationic chitosan adsorbed on the surfaces of the anionic lecithin-stabilized lipid droplets, which is consistent with microstructure from confocal laser scanning microscopy. All emulsions were stable to droplet aggregation, with the exception of 0.05 wt% chitosan. The emulsion viscosity increased when chitosan concentration was increased. All emulsions showed Newtonian flow, with the flow behavior index was approximately 1. However, the shear thinning behavior was observed for emulsion containing 0.05 wt% chitosan. The stability and properties of secondary emulsion to thermal processing (30-90°C for 30 min), freeze-thaw cycling (-18°C for 22 h/25°C for 2 h), high NaCl concentration (0-1000 mM) and pH (3-8) were determined. The ζ -potential of the droplets decreased when the pH and salt concentration was increased. The secondary emulsions had good stability to droplet aggregation during thermal processing but they were unstable to freeze-thaw cycling, high NaCl concentration and high pH (pH 7 and 8) and these unstable emulsions showed shear thinning behavior. Utilization of tuna oil multilayer emulsion which proper condition could lead to the creation of food products with novel characteristics or improved nutritional quality.

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