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Microencapsulation of emulsified flavor using surfactant and sugar beet pectin

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1. Introduction

Microencapsulation of flavors in carrier matrices is a great importance in the flavor and food industries. It can provide protection against the degradation reactions and also prevent the loss of volatile flavors and enhance the stability of the flavor core materials. In this study, the effect of additives on the physicochemical characteristics of microencapsulated powder was investigated.

2. Materials and Methods

The carrier solution was the mixing of wall material (Maltodextrin (MD) and/or Gum Arabic (GA)) and the additives (sucrose ester (SE), polyglycerol ester (PGE) or sugar beet pectin (SBP)). The standard carrier solution (control) was the mixing of MD and GA. The sucrose ester was 95% lauric acid with ester composition of 80% monoester and 20% di, tri, polyester sucrose (L-1695, HLB 16), a food grade. The polyglycerol ester was decaglyceryn laurate (L-7D, HLB 17). *d*-Limonene was used as a model flavor. The carrier solution was 30 wt% and *d*-limonene was added at 20% of the amount of the carrier solution. SE and SBP were prepared by mixing with the MD, and PGE was prepared by mixing with the GA since MD could not apply to the system.

The mixing solution was homogenized by a Polytron homogenizer (PT-6100, Kinematica, Littau, Switzerland) at 8000 rpm for a total time of 3 min with a 30 s interval between every 1 min of homogenization. The emulsion solution was spray-dried in the Ohkawara-L8 spray dryer (Ohkawara Kakouki Co., Ltd.) equipped with a centrifugal atomizer. The feed flow rate was 30 ml/min at various temperatures, the atomizer speed 30,000 rpm, the air flow rates 110 kg/h, the inlet air temperatures 160 ºC, and the outlet air temperatures were in the range of 101-106 ºC.

Analysis of the spray dried powders was consisting of emulsion stability and particle size analysis by SALD-7100, flavor retention and surface oil by using gas chromatography 2010 and structural by scanning electron microscope.

3. Results and Discussion

Fig. 1 shows the effect of additives on the flavor retention and the emulsion particle size. The flavor retention of *d*-limonene in the control was about 86%. In the use of SE, the flavor retention was very low, 3.6%. In contrast, microencapsulated flavor by applying polyglycerol ester gave good encapsulation efficiency, by keeping the flavor retention about 83.3%. In addition, applying sugar beet pectin as emulsifier also gave high percentage of flavor retention (80%).

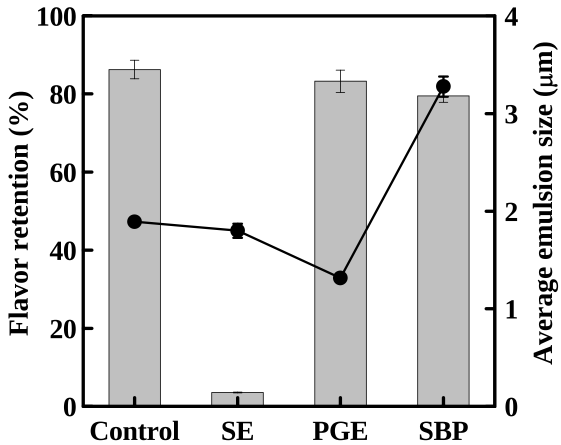

Fig. 1. Effect of additives on the flavor retention (bar graph, ■) and average size of emulsion (●).

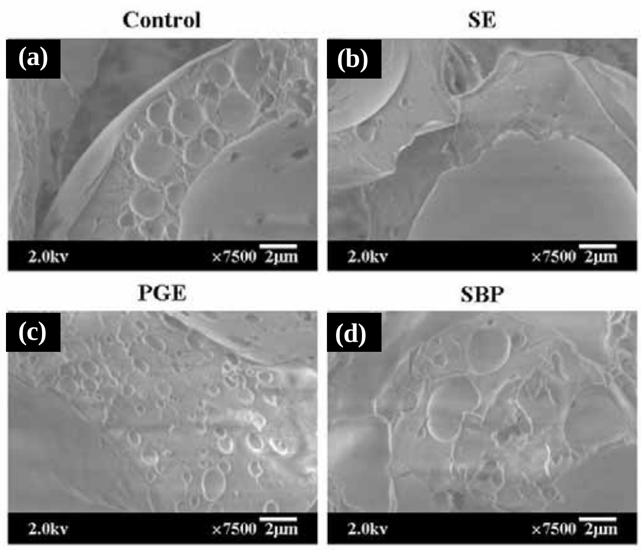

Fig. 2. Internal structure of microencapsulated flavor. Additives: Control (a), SE (b), PGE (c), SBP (d).

The internal structures of these microencapsulated powders were observed, as shown in Fig. 2. In the use of SE, there were few emulsions embedded in the shell wall of spray-dried particles. In contrast, control and in the use of PGE confirmed large number of embedded flavors on the wall region. Using SBP as emulsifier also gave a lot of embedded flavor on the wall area with bigger emulsion particle size.

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