

Effects of sodium lauryl sulfate on the encapsulation of ethanol by spray-drying technique

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The microcapsules containing ethanol in a water-soluble polymer shell could be formed by the spray-drying technique. A mixed solution of ethanol, water and a water-soluble polymer is spray-dried at the lowest possible temperature to obtain a powder product in which the water is substantially removed and the ethanol is encapsulated in water-soluble polymer shell because of the hydrophilic property of polymer and permeability difference between ethanol and water. In this study, the effect of sodium lauryl sulfate (SLS) on the ethanol content, ethanol encapsulation efficiency and yield were investigated to maximize the microencapsulation of ethanol.

The phase diagram of three component system- dextrin, water and ethanol- was established at 20 and 60°C, respectively. A nozzle type minispray dryer was used for the preparation of microcapsules containing ethanol. Dextrin was dissolved in water and then SLS and ethanol were added to this solution one after another. The resulting solution was prewarmed to 60°C. The final solutions were thereafter spray-dried. The ethanol content in the microcapsules was determined using a gas chromatography.

The triangular phase diagram consisted in three regions ; homogeneous phase region, heterogeneous phase region and region in which dextrin can hardly be dissolved. SLS had considerable influence upon the ethanol content. Addition of 0.5~1% of SLS maximized the encapsulation of ethanol. The maximum ethanol contents were 24.1, 35.0 and 35.4% at dextrin/ethanol/water (SLS%) ratios of 0.4/1/1 (0.5%), 0.8/1/1 (1%), 1.2/1/1 (1%), respectively. On the other hand, without SLS, their ethanol contents were 2.6, 7.0 and 32.0%, one after another. The yield, total amount of microcapsules containing ethanol, was increased by adding only less than 0.5% of SLS. To determine the proper compositions of spraying-solution, many different microcapsules were produced from various spraying-solutions containing 1% SLS. The ethanol contents in microcapsules were increased by SLS compared with those of the microcapsules prepared without SLS. When the small amount of dextrin ($0.4 < \text{dextrin/water} < 0.8$) was used, the ethanol content was considerably increased by SLS. This means that the amount of dextrin could be reduced to encapsulate the ethanol with small amount of SLS.