

PRODUCING α -MONOESTERS OF FATTY ACIDS BY TRANSESTERIFICATION IN SUPERCRITICAL CARBON DIOXIDE

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ABSTRACT

Transesterification (glycerolysis) of saturated fats such as tristearin with glycerol is an industrially important chemical reaction that is used to obtain a number of emulsifiers for the food and cosmetic industries. The α -monostearate content and color are critical to the quality of these products and control their market value.

Typically, glycerolysis of tristearin is conducted at temperatures above 250 °C and atmospheric pressure using sodium hydroxide as a catalyst. However, at these conditions the glyceryl α -monostearate content of the product is rather low (less than 50 wt%), and control of some of its properties such as color is difficult.

In this work, glycerolysis of hydrogenated tristearin is being conducted using supercritical carbon dioxide as a reaction medium. Experiments are being performed in a stirred reactor for 2 h at temperatures from 80 to 120 °C and pressures from 3000 to 4000 psig, with a glycerol/tristearin ratio of 4.4. Although preliminary results at these conditions show yields of α -monostearates of only 5 wt%, excellent properties of the product regarding color and texture are observed.

To improve the yield of α -monostearates, control of solubility of the species in the supercritical carbon dioxide is very important. We are using a modification of the SAFT equation of state for estimating the phase equilibria involved in this system. Limitations of this approach for the glycerol-tristearin-monostearates-distearates system are discussed.