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Crystallization behavior of tropical oil by using ultrasound and shear stress simultaneous stimulation

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【Purpose】

As a typical kind of tropical oil, cocoa butter has six polymorphs, among them, form V is the most optimal. In order to promote the polymorphic to form V, there are some methods to control. Most probably, tempering has been applied to produce commercial chocolates. Previous studies have shown that external effects such as ultrasound, shear stress and magnetic field etc. can effectively promote the formation of form V of cocoa butter. However, each of these external factors has been independently, and the results of applying multiple factors at the same time have not been reported. The purpose of this study is to investigate the combined effect of ultrasound and shear stress stimuli on the crystallization of cocoa butter, and the experiments will evaluate the effect of stimulation in terms of morphology and polymorphic changes.

【Methods】

Experimental measurements such as X-ray diffraction, differential scanning calorimetry, and polarizing light microscopy are used to observe the crystalline polymorphism, melting point, morphology of fat crystals, respectively, as well as crystallization behaviors and polymorphic transformation behaviors.

【Results】

The results showed that comparing to shear stress and ultrasound applied separately, simultaneous application crystallized faster and more form V crystals of cocoa butter.

Specifically, different ultrasonic times, shear frequencies, and shear times all had an effect on the results. For the 200 ml cocoa butter sample in this experiment, the combined effect of 10 s ultrasound together with 300 rpm shear stress best promoted the formation of form V crystals, and there seemed to be a trend that the longer the shear time, the better the form V crystals obtained.