

Design of encapsulation of coagulants in W/O emulsions for tofu



INTRODUCTION

Tofu is a traditional soybean food originating in China 2000 years ago. The production is similar to that of cheese from milk, by coagulating soy milk and pressing it into bean curds. Various coagulants can be used however, $MgCl_2$ is preferred as it creates a more natural flavor and allows the original taste of the soybean to be retained. However, the magnesium ions do not quickly dissolve in soymilk and this often results in a rapid solidification of the gel and therefore it produces poor quality tofu.

This study is focused on designing water-in-oil (W/O) emulsions to encapsulate $MgCl_2$ and to control its release to slow down the gelation rate of tofu. This can be used to increase the yield and quality of the tofu.

KEY BENEFITS

VERSATILE

NO DILUTION

FAST AND ACCURATE

MATERIALS

The oil phase was prepared by mixing 0.6 or 1.0 g of the polyglycerol polyricinoleate (PGPR) emulsifier with 60 g soy oil. The aqueous phase that contained different concentrations of $MgCl_2$ varying from 0.4 to 2.6 M, was dispersed in the PGPR-soy oil blend and stirred for 15 minutes at 65 °C (Table 1).

Emulsion	PGPR % (w/w)	$MgCl_2$ (M)
A	0.6	0.4
B		1.2
C		2.0
D		2.5
E	1.0	0.4
F		1.2
G		2.0
H		2.5

Table 1: Compositions in emulsions A-H

EXPERIMENTAL RESULTS

1) TSI of W/O emulsions over 1 day at 65 °C

The global stability of samples is assessed automatically with the Turbiscan Stability Index (TSI). The index adds up all variations in signal due to size variation and phase separation detected in the sample. At a given ageing time, the higher is the TSI, the less stable is the sample.

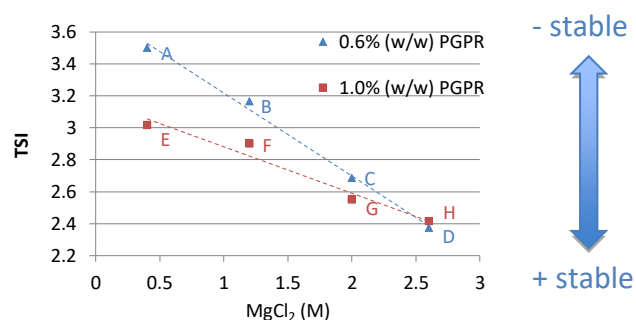


Figure 1: Stability versus PGPR and $MgCl_2$ concentrations at 65°C

Figure 1 shows that the TSI value decreases with the increase of the concentration of $MgCl_2$, indicating that adding magnesium salt improves the stability of W/O emulsions. As the concentration of surfactant PGPR increases from 0.6% to 1.0% (w/w), the TSI value tends to decrease, especially with low concentration of $MgCl_2$. A higher concentration of PGPR could rapidly coat and rigidify the interfacial film of a newly-formed emulsion and therefore prevent the coalescence. Thanks to the TSI, these conclusions could be made quickly after one day.

2) Stability of W/O emulsions over 14 days of storage at room temperature

To obtain a better comparison of the stability of these emulsions they were monitored over 14 days, the variations of the backscattering (ΔBS) profile were measured at 25°C. Figure 2 shows the results obtained for sample A.