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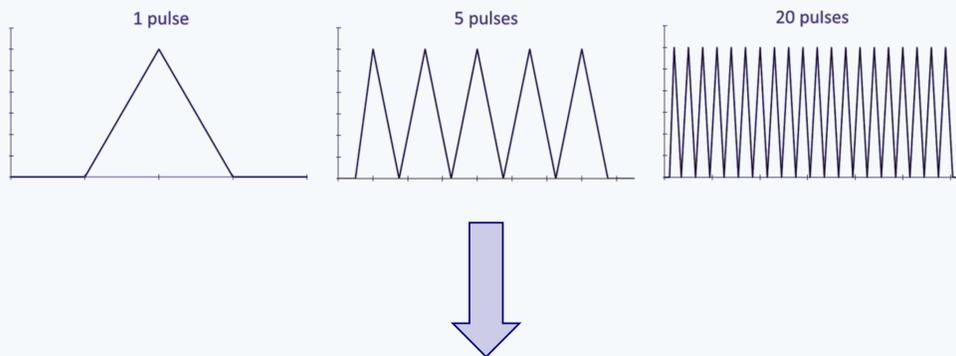
I. Introduction

Pressurising triacylglycerols, especially above 100 MPa, has been observed to reduce crystallisation induction times. However, the degree at which this occurs, seems to be dependent on the pressure applied, being stronger below 300 MPa^{1,2}. From the work by Yasuda, et al (1992), it was observed that the pressure protocol followed also affects the crystallisation behaviour, showing that cocoa butter developed a higher amount of β -V when applying 150 MPa twice, and holding for 10 minutes. Unfortunately, literature on the application of pressures below 100 MPa is scarce. Regardless, a patent by Redding, B.K. reports preferential nucleation of the β -polymorph, in tristearin, when applying 30 MPa pulses at 90 °C.

Therefore, the aim of this work was to follow a similar experimental protocol to that of Redding, on cocoa butter, to determine if the preferential β -crystallisation also occurs in mixed-composition, mono-unsaturated, triacylglycerol systems.

II. Experimental methods

West African cocoa butter
HEATED to 50 °C
PRESSURE- treated at 30 MPa



COOL at room temperature: 36 h

X-ray scattering

Small and Wide Angle
Anton Paar SAXSpace
Cu-anode @ 40 kV and 50 mA
($\lambda = 0.154$ nm)
T = 23 °C
E_t = 10 min

DSC

Perkin Elmer 8000
Scan from -30 °C to 70 °C
Heating rate: 50 °C/min

III. Results

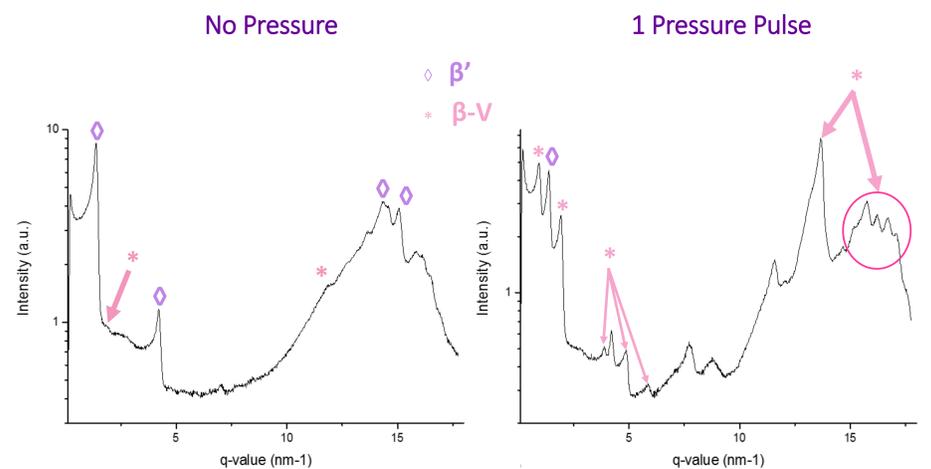


Fig. 1. X-ray scattering of cocoa butter temperature treated (left), and pressure treated with only one pulse (right). The purple arrows identify the peaks related to the β' polymorph, whilst the pink ones indicate the peaks associated to the β -V polymorph. All the pressure treated samples present a more developed β -V polymorph when compared to the no-pressure treatment

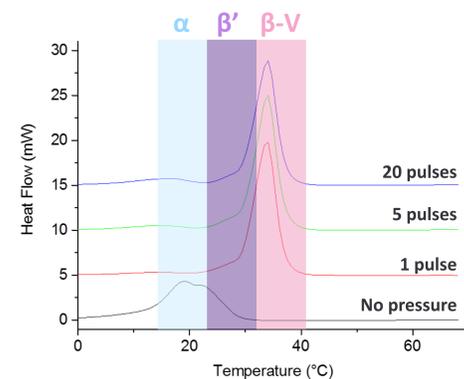


Fig. 2. DSC thermograms of all treatments. The blue area relates to the α -phase melting range, the purple to the β' , and the pink one to the β -V polymorph. When no pressure was applied, the sample did not develop any β -V polymorph.

IV. Conclusion

The application of pressure pulses on CB resulted in the preferential crystallisation of the β -polymorph.

Both, SWAXS and DSC results are in general agreement with Redding, B. K. 1993. However, 1 pulse was enough to induce the β -polymorph crystallisation, and no further benefit was obtained by multiple pulses, contrary to what has been reported.

The previous suggests that lower pressures have a potential application for fat crystallisation processes.

References

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