Factors Influencing the Acetone Fractionation of Palm Olein

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Solvent fractionation is particularly useful to isolate sharp-melting fractions suitable for use in confectionery fats from raw materials such as palm oil. It provides the necessary solid-liquid separation efficiency that can be difficult to achieve using dry fractionation. The viability and profitability of the fractionation process is dependent on the ease and efficiency of this separation. In this paper we describe the effect of metastable zone width on the crystal morphology of 1,3-dipalmitoyl-2-oleoylglycerol (POP) and tripalmitoylglycerol (PPP) as well as discussing the occurrence of liquid-liquid phase separation during fractionation.

The metastable zone width was found to be relatively insensitive to cooling rate for 1,3-dipalmitoyl-2-oleoylglycerol (POP) but tripalmitoylglycerol (PPP) metastable zone width demonstrated a slight dependence on concentration. The spherulitic POP crystals had a more open structure at slower cooling rates. PPP had more plate-like crystals but produced powdery, amorphous crystals at high cooling rates.

The morphology of the crystals from a mixed POP/PPP system shifted from spherulitic (pure POP) to a more lamellar structure with as little as 2% PPP. These changes in structure, although relatively minor, nevertheless may be crucially important in relation to palm olein processing, where the presence of trisaturated triacylglycerols can help to reduce the degree of undercooling necessary prior to crystallisation and thereby improve the ease of washing of the resulting precipitate.

Under certain conditions, such as high cooling rates or raised water contents in the system, liquid-liquid phase separation can occur, resulting in the formation of oil rich droplets. Nucleation occurs at higher temperature in such droplets (compared to the original solution), which can be viewed as a positive effect. However, since the crystals grow in an oil enriched environment, any trapped (occluded) liquid has a relatively high concentration of oil, which may be difficult to remove.