The Ternary Phase behavior of PLP, PLS and SLS

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In this study, we investigated the crystallization behavior and interactions between minor triacylglycerols present in cocoa butter. Specifically, we focused on 1,3-dipalmitoyl-2-linoleoyl-glycerol (PLP), 2-linoleoyl-1-palmitoyl-3-stearoyl-rac-glycerol (PLS), and 1,3-distearoyl-2-linoleoyl-glycerol (SLS) ternary mixtures, which mimic the composition of the main triacylglycerols with the substitution of oleic acid by linoleic acid. Pure components (99 %) were synthesized and mixed in various ratios to create 27 mixtures. Through X-ray diffraction and differential scanning calorimetry, we examined the phase behavior of these mixtures during rapid cooling and heating. Our results revealed the melting temperatures and mutual interactions of sub-α and γ polymorphic forms of triacylglycerols. No other polymorphic modifications were observed under the experimental conditions. Additionally, we proposed a phase diagram for the ternary mixture, which can be valuable for modeling fat structuring systems in food and cosmetic applications. These findings contribute to a better understanding of the crystallization behavior of fats.