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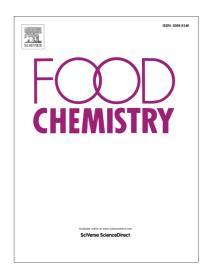
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Temperature Dependent Raman and X-ray Diffraction studies of Anhydrous Milk Fat

A. Lambert^{1*}, F. Bougrioua¹, O. Abbas², M. Courty³, M. El Marssi⁴, V. Faivre⁵, S. Bresson¹

ABSTRACT

Raman spectroscopy was used to characterize the polymorphs and liquid state of anhydrous milk fat, with emphasis placed on the thermal evolution of the ester carbonyl stretching modes (1800-1700 cm⁻¹) and the comparative study of the Raman-active C=C (1660 cm⁻¹) and C-H (3000-2700 cm⁻¹) vibrational modes. Specific Raman signatures in the crystalline phase were found and attributed to the coexistence of two groups of triglycerides. This was confirmed using differential scanning calorimetry and X-ray diffraction methods. In the ester carbonyl band, the effect of changing temperature on both the number of modes and new defined intensity ratios was studied and enabled polymorph discrimination. C-H stretching signals increased with polymorph stability, indicating the dominance of antisymmetric C-H methylene vibrations as the anhydrous milk fats crystal lattice became more ordered. The change in intensity of the C-H stretching bands as a function of temperature was used to probe the order-disorder transition.

KEYWORDS: Raman spectroscopy, Anhydrous Milk Fats, X-ray diffraction, liquid state, crystallization, polymorphism, DSC.

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