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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

¹*Laboratoire de Physique des Systèmes Complexes, Université Picardie Jules Verne, 33 rue S^t Leu 80039 Amiens cedex, France*

²*Walloon Agricultural Research Centre (CRA-W), Valorisation of Agricultural Products, Department, Food and Feed Quality Unit (U15), 'Henseval Building', Chaussée de Namur 24, 5030 Gembloux, Belgium*

³*Laboratoire de Réactivité de Chimie du Solide, Université Picardie Jules Verne, 33 rue S^t Leu 80039 Amiens cedex, France*

⁴*Laboratoire de Physique de la Matière Condensée, Université Picardie Jules Verne, 33 rue S^t Leu 80039 Amiens cedex, France*

⁵*Institut Galien Paris-Sud, Univ. Paris-Sud, Université Paris-Saclay
5 rue JB Clément, 92296 Châtenay-Malabry, France*

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 ($1800\text{--}1700\text{ cm}^{-1}$) and the comparative study of the Raman-active C=C (1660 cm^{-1}) and C-H ($3000\text{--}2700\text{ cm}^{-1}$) 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.

*corresponding author (albane.lambert@wanadoo.fr)

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