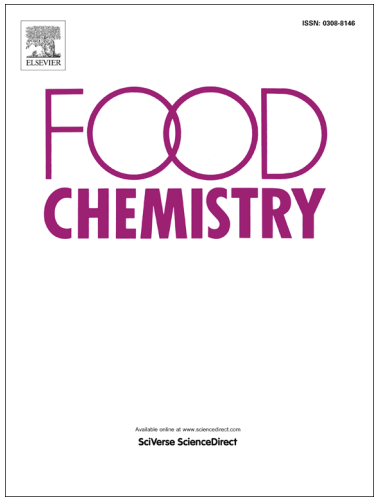

Temperature Dependent Raman and X-ray Diffraction studies of Anhydrous Milk Fat

A. Lambert, F. Bougrioua, O. Abbas, M. Courty, M. El Marssi, V. Faivre, S. Bresson

PII: S0308-8146(17)31457-7
DOI: http://dx.doi.org/10.1016/j.foodchem.2017.09.006
Reference: FOCH 21675

To appear in: *Food Chemistry*

Received Date: 5 March 2017
Revised Date: 6 July 2017
Accepted Date: 1 September 2017

Please cite this article as: Lambert, A., Bougrioua, F., Abbas, O., Courty, M., El Marssi, M., Faivre, V., Bresson, S., Temperature Dependent Raman and X-ray Diffraction studies of Anhydrous Milk Fat, *Food Chemistry* (2017), doi: http://dx.doi.org/10.1016/j.foodchem.2017.09.006

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

A. Lambert[1*], F. Bougrioua[1], O. Abbas[2], M. Courty[3], M. El Marssi[4], V. Faivre[5], S. Bresson[1]

[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 (1800-1700 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.

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