

## Accepted Manuscript

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PII: S0963-9969(17)30087-X

DOI: doi: [10.1016/j.foodres.2017.02.022](https://doi.org/10.1016/j.foodres.2017.02.022)

Reference: FRIN 6605

To appear in: *Food Research International*

Received date: 29 November 2016

Revised date: 22 February 2017

Accepted date: 26 February 2017

Please cite this article as: Tuyen Truong, Martin Palmer, Nidhi Bansal, Bhesh Bhandari, Effect of solubilised carbon dioxide at low partial pressure on crystallisation behaviour, microstructure and texture of anhydrous milk fat. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. *Food Research International* (2017), doi: [10.1016/j.foodres.2017.02.022](https://doi.org/10.1016/j.foodres.2017.02.022)

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## Effect of solubilised carbon dioxide at low partial pressure on crystallisation behaviour, microstructure and texture of anhydrous milk fat

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### Abstract

The crystallisation and melting behaviour, fat polymorphs, microstructure and texture of anhydrous milk fat (AMF) was investigated in the presence of dissolved CO<sub>2</sub> (0 – 2000 ppm) under two crystallising conditions (non-isothermal versus isothermal). CO<sub>2</sub> was found to induce higher onset crystallisation temperature during cooling from 35 to 5°C at 0.5°C min<sup>-1</sup>.

X-ray scattering analysis showed that, in the presence of dissolved CO<sub>2</sub>, this rapid crystallisation caused the formation of unstable,  $\alpha$  polymorph fat crystals. For milk fat crystallised under isothermal condition at 25°C for 48h, dissolved CO<sub>2</sub> improved solid fat content, slightly depressed melting temperature and exhibited a sharper melting peak.

Microstructure of AMF visualised by Polarised light microscopy of crystallised AMF showed that increasing dissolved CO<sub>2</sub> concentration was associated with smaller crystal size and greater crystal number. The bulk properties of the fat appeared to mirror the microstructural differences, in that the texture of CO<sub>2</sub>-treated AMF was harder under isothermal condition but became softer than untreated AMF under cooling condition. The results of this study are of significance in understanding how CO<sub>2</sub> treatment might be used to modulate the crystallisation behaviour of milkfat and thereby the structural development and physical functionality of fat-containing dairy products.

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