

# Microbeam X-ray Diffraction Study for Structure of Granular Crystal of Margarine

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## Abstract

As one of the most promising *trans*-fat alternatives, the application of palm oil for solid fats, such as margarine and cream, is increasing. However, granular crystals often occur in palm oil-based solid fats as a deteriorating event. A lot of studies have been performed to clarify the formation mechanisms of granular crystals, which are still open to question. In this study, we tried to clarify the structure of granular crystals (diameter ~ 2 mm) grown at 5 °C for 8 months in margarine using a scanning method by synchrotron radiation microbeam, whose cross section was 5 x 5 micrometer, X-ray diffraction (SR-micro-XRD).

The results are as follows; (1) In the center region of a granular crystal, the lamellar (long spacing) X-ray diffraction peaks corresponding to the double and triple chain length structures were simultaneously observed. (2) In the out of center region of a granular crystal, the lamellar patterns corresponding to triple chain length structure were only obtained. Considering the above results with the results obtained by the conventional XRD and differential scanning calorimetry (DSC), and the major triacylglycerol composition of palm-blended margarine, we conclude the following two points; (i) the POP beta form dominate in granular crystals, (ii) at first, the beta or beta-prime form of PPP will be crystallized, secondly, POP beta form crystallizes at the out of PPP nucleus and grows. We consider that the role of PPP crystallization should be the template for POP beta form crystallization.