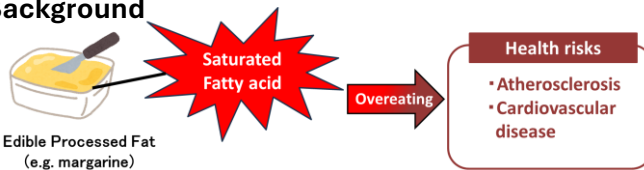


Formation mechanism of lipid whisker crystals for development of oleogels with controllable physical properties

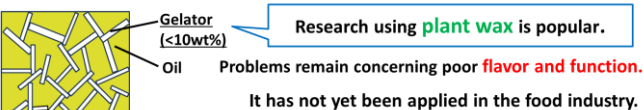
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Introduction

Background



Oleogels are gaining a spotlight as an alternative to the food processed fats.



Lipid Whisker crystal

High-aspect-ratio crystals with **single-crystal** characteristics formed by adding **Fully Hydrogenated Hard Palm Mid Fraction (FHHPMF)**, which contains a high amount of **PSP** a type of lipid molecule, as a gelator into canola oil.

Oleogel containing whisker crystal

Even with the applying of **0.5 wt%** gelator, it has very stable property and high mechanical strength. H.Koizumi et al., *Food Research International* 214 116451 (2025)

< Problem >

- Two weeks required for whisker crystal formation.

Too long!!

Purpose

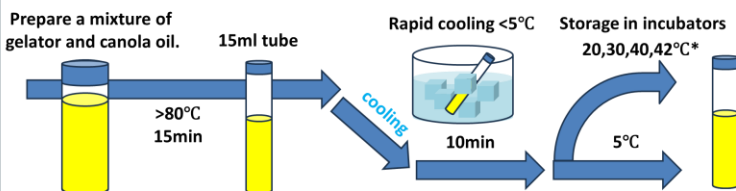
Elucidation of the Whisker Crystal Formation Mechanism for Efficient Production of Oleogels with Superior Physical Properties.

Method

Oleogel Preparation

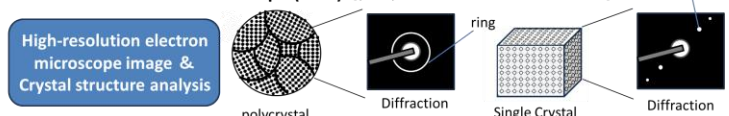
Material

Gelator: PSP(99.8%)* (Provided by Miyoshi Oil & Fat Co.,Ltd) *purity
Liquid oils: canola oil (Commercially sold)

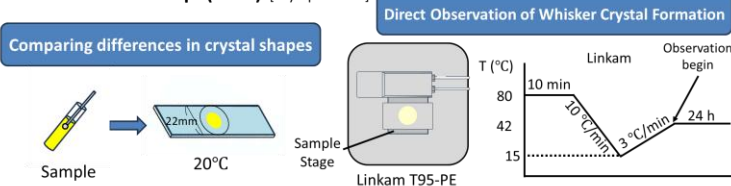


PSP : canola oil = 2 wt% : 98 wt%

Transmission Electron Microscope (TEM) [JEOL JEM-2010F ILTS Hokkaido Univ.]

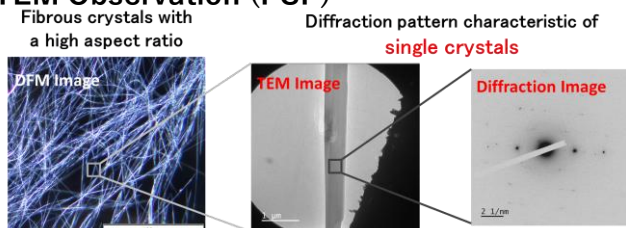


Dark Field Microscope(DFM) [Olympus BX53]



Result

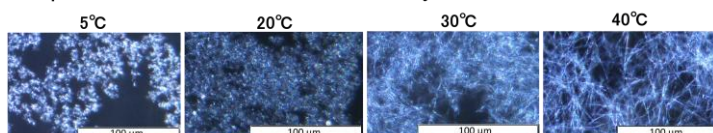
OTEM Observation (PSP)



Lipid crystal with whisker-like characteristics = **Lipid Whisker Crystal**

OCrystal Shape Changes with Temperature Variation

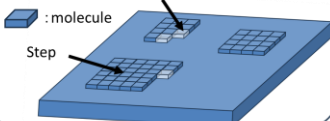
Sample PSP : Canola Oil = 2 wt% : 98wt% 1 day



Discussion

General crystal growth

Growing surface Kink: Molecules are absorb.

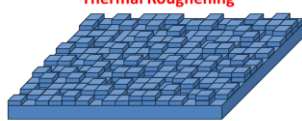


In the case of whisker crystals

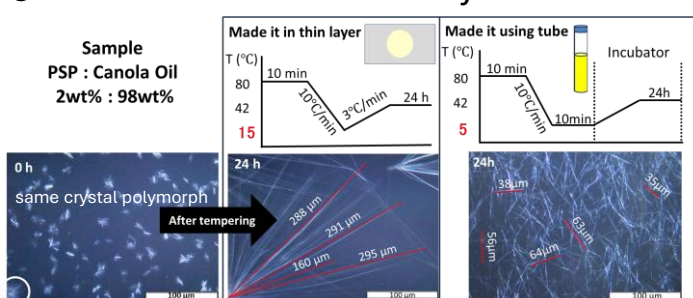
High tempering temperature → Surface roughness

Increased kink → Fast growing !

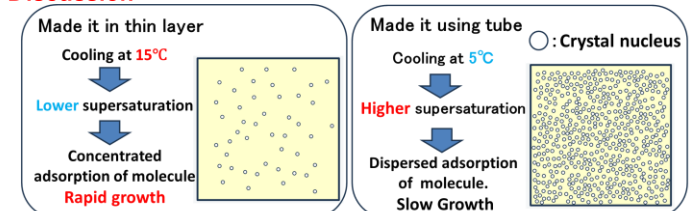
Thermal Roughening



ODirect Observation of Whisker Crystal Formation



Discussion



Conclusion

It was found that whisker crystals can be formed in a short time by controlling the nucleation rate and tempering temperature.



Enable efficient oleogel preparation and physical property control !