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Characterization of Oxidative Stability for Oils and Fats by TG/DTA

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Introduction

The oils and fats is susceptible to oxidation degradation which sometimes forms the toxic materials as well as changes the smell, the taste, of the color of the foods. Thus many countries establish the food-safety standards. In Japan, the analytical method of the acid value and the peroxide value are used as the official method of analyses for evaluating the food oxidation degradation. However, these methods require the extraction of the oil and fat content resulting in the many operation and much time. Moreover. As these methods extract only the oil and the fat content of the food, only the oil and the fat content are evaluated. Hence, the deterioration behavior of the whole food including the additives and the other blended components cannot be evaluated. The easier method of TG/DTA is introduced to evaluate oxidation of oils and fats.

This study was carried out to evaluate the oxidation of the oils, fats and process food by Oxidation Induction Time (OIT) using TG/DTA.

Experiment

Materials

Sample 1: Cooking oil
- Soybean oil
- Sesame oil
- Palm oil

Sample 2: Fatty acid
- Stealic acid (0*)
- Oleic acid (1*)
- Linoleic acid (2*)
- Linolenic acid (3*)

* Number of unsaturated bond.

Sample 3 : Processed food
- Dried soybean
- Sesame
- Snacks
- Instant noodle

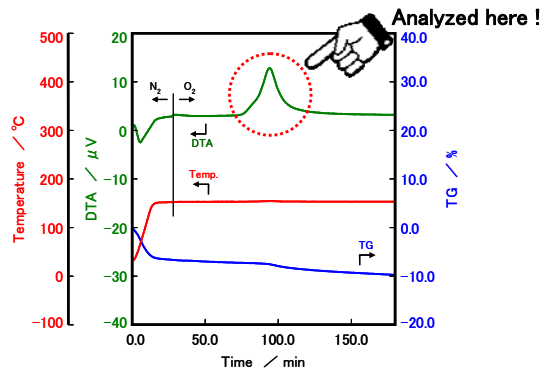
Preparation
Crash samples with a food mill for 30 sec.
Store them at room temperature.
Measure after a period of time.

Instrument

TG/DTA7200
(SII NanoTechnology Inc.)

Measurement condition

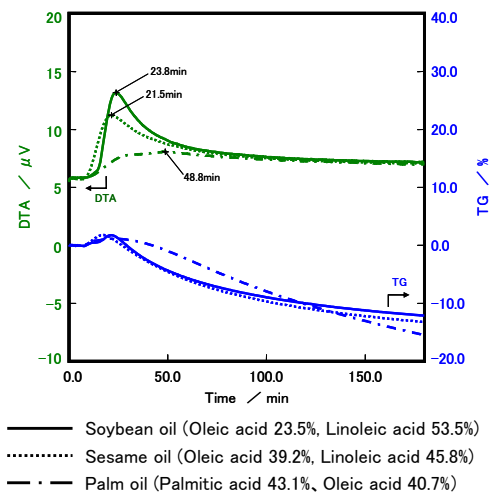
Temperature range: R.T. to 200℃
Heating rate: 10℃/min
Atmosphere: N_2 and Air



Results

Sample 1: Cooking Oil

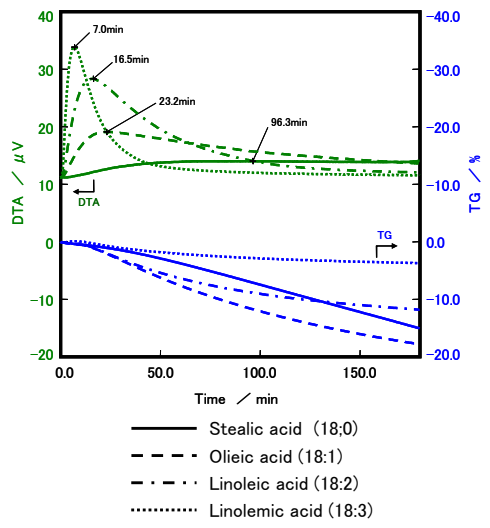
Effect to OIT by the difference of the amount of unsaturated fatty acid.



This result indicates that oil is susceptible to oxidation by the effect of unsaturated acid.

Sample 2: Fatty Acid

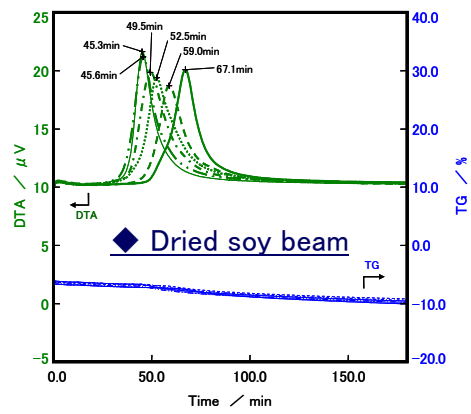
Effect to OIT by the difference of the number of unsaturated bond.

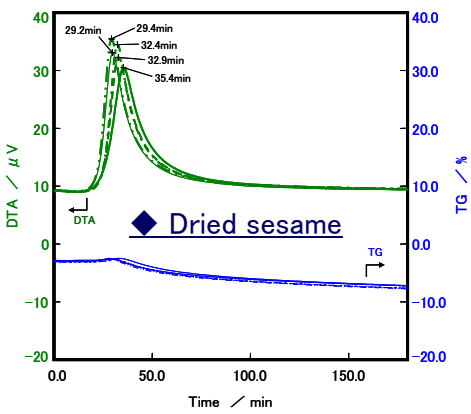


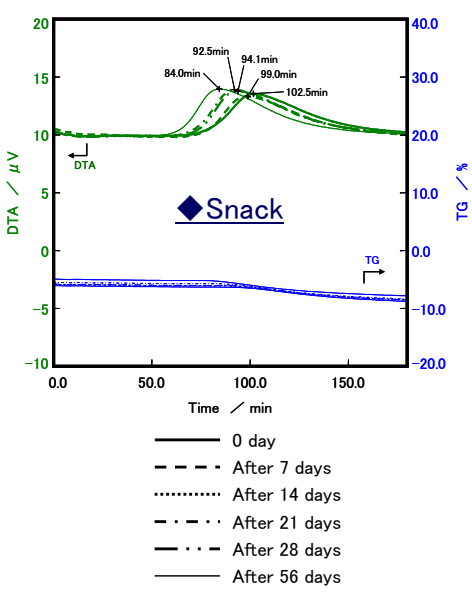
This result shows that fatty acid is susceptible to oxidation by the number of unsaturated bond.

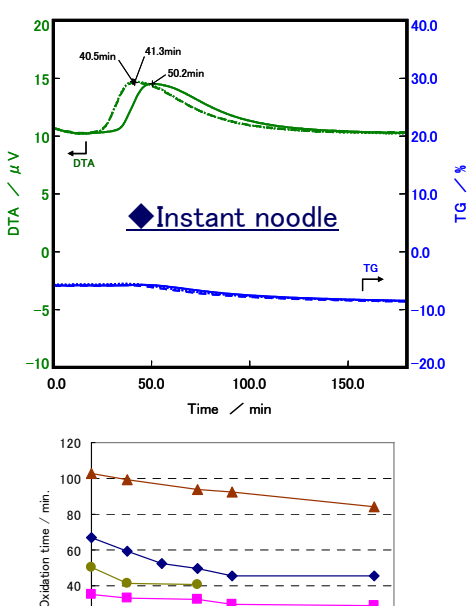
Sample 3: Processed food

Effect to OIT by the difference of the storage days.









The longer the processed foods are stored, the shorter OIT becomes. By oxidation reaction of oil and fat in processed food proceeds as time goes by, they become easily-oxidizable.

Relationship between storage days and oxidation induction time

Conclusions

- Relationship between the amount of oils and fats which consists of unsaturated fatty acid and oxidation characteristic is observed.
- Oxidation characteristic can be analyzed with out extraction of the oil and fat in case of the processed food.

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