INTERESTERIFIED PALM PRODUCTS AS HARD STOCK FOR SOLID FAT FORMULATIONS

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nteresterification (IE) is a powerful tool for modification of the physical and chemical properties of oils and fats. IE involves redistribution and interchange of fatty acids (FAs) within and between the triacylglycerol molecules, which make up all oils and fats. The result is a significantly changed melting and crystallization behaviour. No changes occur to the FA composition. Therefore, IE does not result in the formation of either trans or geometrical isomers of FAs. However, IE has not been given due attention in the food industry since hydrogenation was the preferred process especially for the production of solid fats such as margarine and shortening.

Partially hydrogenated vegetable oils containing trans FAs are a near-perfect ingredient because they can be tailored for specific applications. But, trans FAs resulting from partial hydrogenation have been proven to raise the low-density lipoprotein (bad) cholesterol level, causing the arteries to become hardened and clogged, and increase the risk for cardiovascular disease (Reddy and Jeyarani, 2001). It has therefore been recommended that *trans* FAs be removed from food systems.

Due to the health implications of the trans FAs and increased consumer awareness of trans fats in their diet, the food industry is gradually phasing out the use of hydrogenated fats in their products. In 2003, Denmark became the first country to introduce restrictions on the use of industrially produced *trans* FAs. Oils and fats are now forbidden on the Danish market if they contain trans FAs exceeding 2%, a move which effectively bans partially hydrogenated oils.

Other European countries have yet to impose such rules, but pressure is mounting from consumer-led organizations (FoodQuality news.com, 2005). In the USA, the Food and Drug Administration has mandated the inclusion of trans FAs content on food labels starting 1 January 2006.

IE provides an alternative for food manufacturers looking for reduced trans fats in their products. For instance, there has been a great increase in the use of interesterified fats (especially in Europe) as hard stocks in solid fat formulations, as replacements for trans fats.

This technology offers several *trans*-free fats suitable as fat blend or hard stock for the manufacture of low or zero trans solid fats such as margarine, shortening and spread. Using these trans-free fats, post-hardening – a problem in solid fats formulated with a high percentage of palm oil products - can also be eliminated.

IE PROCESS

IE modifies the physical properties of the oil by interchange of FAs between and within the different triglycerides. The reaction is catalyst driven at about 100°C under vacuum.

The process involves the following steps:

- 1. Neutral feedstock is pumped batch-wise into the IE vessel.
- 2. The oil is heated under vacuum and dried.
- 3. Catalyst is added and the reaction started.
- 4. After the reaction is complete, the catalyst is deactivated by addition of a dilute aqueous citric acid solution.
- 5. The interesterified oil is washed with water to remove soap by-products and then dried under
- 6. A light post-bleaching step is carried out to remove residual soaps, trace metals and oxidized bodies.
- 7. The interesterified oil is deodorized to remove free FAs and other volatile impurities.

MPOB PALM-BASED INTERESTERIFIED FATS

The MPOB palm-based interesterified fats (MPOB IE-FATs) were produced using a 70kg capacity batch IE pilot plant. When blended with other oils and fats, they gave the right melting properties for certain applications. The solid fat content (SFC) profiles of some of the MPOB IE-FATs suitable as hard stock for plastic fat formulations are shown in *Figure 1*.

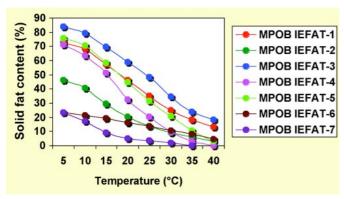


Figure 1. Solid fat content profiles of MPOB IE-FATs hard stock for solid fat formulations.

APPLICATIONS

The palm-based *trans*-free MPOB IE-FATs can be used as fat blend or hard stock for the manufacture of low or zero trans FAs solid fats such as margarine, shortening, spread and pastry fat. At the same time, the MPOB IE-FATs help to reduce the saturated FA (SAFA) level in the solid fat formulations. For instance, the trans-free MPOB IE-FATs can be used to produce tub and block type table margarine/spread with desirable mouth feel, good spreadability at refrigeration temperature and low SAFA content. Examples of SFC profiles of oil blend formulations for such table margarines / spread are shown in *Figure* 2. The SAFA contents of the oil blend formulations for block (coded A) and tub (coded B) type table margarine/spread are 25.1% and 17.3%, respectively. Post-hardening, which usually occurs in table margarine/spread formulated with palm products, especially those stored at refrigeration temperature, may also be averted.

The MPOB IE-FATs are also suitable in the formulation of bakery margarine/shortening low in SAFA. An example of a *trans*-free bakery shortening blends having good plasticity over a broad temperature range (similar to USA commercial products) is blend C in *Figure* 2. It contains 29.5% SAFAs, much lower than the contents in most of the popular US brands. Bakery fats having a balance saturated, monounsaturated and polyunsaturated FA content can also be produced using the MPOB IE-FATs as hard stock.

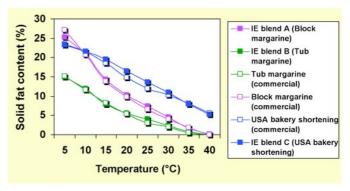


Figure 2. SFC profiles of oil blend formulations for various types of solid fat products using MPOB IE-FATs as hard stock.

NOVELTY OF MPOB IE-FATs HARD STOCK

- Free of *trans* FAs.
- A more healthy fat formulation.
- Rapid crystallization rate compared to non-IE palm-based hard stock.
- Provides the right melting properties and good plasticity.
- Can be used as fat blend/hard stock for the manufacture of low SAFA solid fats.
- Helps eliminate/reduce the post-hardening problem in palm-based solid fats.

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