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AKOPOL LT

Low in trans with high functionality

CBR is an easy-to-use, cost-efficient fat for chocolate-flavoured compound coatings. In response to the global quest for low-trans fats, AAK has developed a new range of low-trans cocoa butter replacers (CBR), AKOPOL LT, as an alternative to conventional high-trans CBR fats. For a confectionary manufacturer, two of the most important parameters for a CBR are the crystallisation/setting time in the cooling tunnel and a bloom-stable final product. The AKOPOL LT range has user advantages similar to conventional CBR, but trans-fatty acids have been reduced by up to 90 %.

High demand for replacing conventional CBR

Cocoa butter replacers are popular thanks to their convenience and high functionality. Compared to cocoa butter and cocoa butter equivalents, the cost for ingredients is significantly lower, and production is simplified since the tempering step is omitted. AKOPOL, the CBR range, can be used for coatings as well as in moulded products, with or without fillings. As CBR is based on non-lauric raw material, it also means it can be used in a wide variety of recipes, containing everything from cocoa liquor to water, and still give a perfect end result. One disadvantage of conventional CBR is that it contains high concentrations of trans-fatty acids, whose nutritional aspects have been questioned in recent years. Today there is a high demand for replacing conventional CBR fats with alternatives lower in trans-fatty acids.

For a confectionary manufacturer using CBR fats in coatings, a low viscosity of the coating compound is very important to be able to coat in a thin layer. The crystallisation (setting) time in the cooing tunnel is also crucial, so that the coating is crystallised and the confectionary items can be packed when they exit the tunnel.

In the same way, when CBR is used in moulded products, the setting time for the compound to contract in the mould is very important.

The main advantage of conventional CBR is the functionality of the trans-fatty acids. Trans-fatty acids are similar to saturated fatty acids, with an almost straight configuration of the fatty-acid chains, and triglycerides such as PEP, PPE crystallise very fast into a stable ß´ crystal polymorph. This means that the tempering step for the confectionery compound that is compulsory with cocoa butter and cocoa butter equivalents is not needed.

In addition, thanks to the stable ß´ crystal form, there will be no recrystallisation and formation of large fat crystals with time; hence the CBR fat will provide a bloom-stable coating or compound.

With these functional advantages of trans-fatty acids, it is clear that in order to decrease the trans-fatty acids of conventional CBR fats and still provide a fast-crystallising and bloom-stable confectionary product, a thorough understanding of different triglyceride interactions is necessary. In addistion the hydrogenation of the fat has to be optimised so that a low level of trans delivers the maximal functionality.

Fastest crystallisation of low trans CBR

When fat that is high in trans-fatty acids crystallises, there is very fast transformation from the α form (the most unstable polymorphic form) to the ß´ form; or it may crystallise directly into the ß´ form. The fast crystallisation of ß´ is due to the rather uniform configuration of the trans-fatty acid chains. Because of this, the α to ß´ transformation is not noticed in the crystallisation of confectionary products containing conventional CBR fats. In fat systems containing less trans-fatty acid, the α form may be retained for longer periods, in particular if the fat is crystallised at lower temperatures. Consequently, a longer life time of the α phase and a slower crystallisation start of the ß´ polymorph will render the crystallisation time longer for the fat. For the new low-trans CBR products, hydrogenation minimises the effect of the slow α to ß´ transformation. Nevertheless, with a lower trans level, the α form will be somewhat more stable, as illustrated in Table 1.

Optimising bloom stability of low-trans CBR

In respect of optimal bloom stability for a low-trans CBR, trans-fatty acids had to be replaced by triglycerides that crystallised quickly and were stable in their crystal form. It is known from cocoa butter and cocoa butter equivalents that systems high in symmetrical triglycerides (SUS, S=saturated, U=unsaturated) need to be tempered into the right polymorphic form, otherwise they will recrystallise to a more stable form and consequently give bloom. However, by combining certain ratios of symmetrical and asymmetrical triglycerides (SUS/SSU), the fat system will remain stable in a ß´ polymorph. Thus by utilising this knowledge in combination with a low level of trans-fatty acids, the AKOPOL LT range achieves optimal bloom stability. The best bloom stability has been found for the AKOPOL LT products with higher trans content (Table 2).

New low-trans compound fats: AKOPOL LT11, AKOPOL LT08 and AKOPOL LT05

The new AKOPOL LT range has trans-fatty acid concentrations of 5-11 % trans (AKOPOL LT05 with 5 % trans, AKOPOL LT08 with 8 % trans

Table 1. The polymorphic transformations of the fat crystals were studied with a DSC instrument in the fat phase and in a chocolate compound. The melting enthalpy of the alpha form was measured. The results show that the most stable α phase is formed in the AKOPOL LT05 and that it is not noticed in AKOPOL ER.

	ΔH (αpeak) (J/g)	
CBR fat	Pure fat	In compound
AKOPOL LT05	45	15
AKOPOL LT08	39	9
AKOPOL LT11	30	5
AKOPOL ER	0	0

Table 2. Visual bloom (% of surface) on compound coatings stored at 18°C for 12 months.

	Months			
CBR fett	3	6	9	12
AKOPOL ER	0	0	0	0
AKOPOL LT11	0	0	0	0
AKOPOL LT5	0	0	8	12

and AKOPOL LT11 with 11 % trans). These fats are excellent for coating and moulding and the sensory properties are very similar to conventional CBR fats. They have good bloom stability, substantially improved compared to earlier generations of low trans CBR. The AKOPOL LT range also has a healthier profile with significantly lower content of trans plus saturated fatty acids (Table 3). For a coating application, if fast crystallisation is the most important feature, AKOPOL LT11 should be chosen. For moulded products with the best sensory properties, AKOPOL LT05 should be used. (See Table 2 for detailed features of the products).

Table 3. Product features

	AKOPOL LT11	AKOPOL LT08	AKOPOL LT05	Conventional CBR
Nutritional profile	11 % TFA 69 % TFA+SFA[2)]	8 % TFA 69 % TFA+SFA	5 % TFA 69 % TFA+SFA	50 % TFA 85 % TFA+SFA
Application	Coating	Coating & Moulding	Coating & Moulding	Coating & Moulding
Crystallisation	Fast	Intermediate	Intermediate	Fast
Bloom stability[1)]	>1 year	> 8 months	> 8 months	>1 year

1) In cocoa powder recipes
2) TFA: Trans Fatty Acids, SFA: Saturated Fatty Acids