SCI LECTURE PAPERS SERIES

PHYSICAL PROPERTIES OF INTERESTERIFIED BLENDS

Leny deMan
deMan Food Technology Services Inc, Guelph, ON Canada
E-mail: jdeman@uoguelph.ca

ISSN 1353-114X
LPS 120/2000

Keywords *solids, margarines, melting, texture, interesterification, hardstock.*

Substituting the hydrogenated solids in margarines with interesterified solids requires knowledge about the physical and chemical characteristics of the hydrogenated hard stocks. This paper reports on the properties of solids isolated from stick (N=9) and soft (N=10) margarines. Methods include 1. fractionation of the fat by means of acetone at 15, 10, 5 and 0°C to obtain the HMG and 2. separation of the solids in the soft margarines at 5 °C by means of isobutanol extraction of the liquid phase. The 15°C HMG of the stick margarines consisted mainly of saturated and *trans* isomers (50-50%). Subsequent acetone fractions at lower temperatures contained less saturated but more *trans* fatty acids. The 15 °C HMG of the soft hydrogenated margarines were similar to those of the stick margarines and their mean DSC melting peaks were at 55 °C. Two of the soft margarines contained an interesterified hardstock. The 16:0 fatty acid level of their HMG was high, that of their solids contained more medium chain fatty acids. The melting behavior of a series of tri- di- and mono-saturated TAG are presented for possible replacement of the hydrogenated TAG. Range of melting points of long chain trisaturated TAG is from 56.7 to 68.8 °C. Those of disaturated- monounsaturated are from 30-37 °C. Those of mixtures of saturated long and medium chain TAG are intermediate. Other experiments have shown that the texture of natural fats having unhydrogenated solids may behave differently from fats having hydrogenated solids at similar SFC. Reasons may be that TAG that contain *trans* fatty acids behave like saturated fatty acids unlike TAG containing an oleic acid Incorporation of medium chain fatty acids into the solids will result in saturated solids with higher melting points than the di-saturated TAG but not as high as the trisaturates of long chain TAG. As with most margarines, a β' stabilizing compound will be required to ensure a β' product. An attractive product is a selectively hydrogenated palm olein or palm mid fraction. It contains the TAG PEP, a TAG that is very stable in the β' form. If incorporated at a level of 1% in soft margarines, it will constitute 10% of the solids, sufficient to stabilize the β' structure and will result in a trans content of only 0.3 %. Solid fat formation in the hydrogenation process can be manipulated by temperature, hydrogen pressure and by type and level of catalyst. In chemical interesterification processes the fatty acid composition is the only variable that influences the formation of solids. It should be possible to develop software that can predict the composition of TAG and of the solids that are formed in the interesterification process when the levels of fatty acids of a blend or blends are known, taking into account the solubility of solids in the liquid oil.

References

Chemical and physical properties of the high melting glyceride fractions of commercial margarines. V. D'Souza, L. deMan and J.M. deMan. J. Am Oil Chem. Soc. 68, 153-162, 1991.

Chemical and physical properties of the solid fat in commercial soft margarines. V. D'Souza, J.M. deMan and L deMan. J. Am. Oil Chem. Soc. 69: 1198-1205, 1992.

Texture measurements of some plastic fats. L. deMan, J.M. deMan. Oils-Fats-Lipids. Proceedings of the 21st World Congress of the International Society of Fat Research. (ISF),The Hague. Vol. 3 pp. 561-563. Publ. P.J. Barnes & Associates. Bridgwater, TA7 OYZ, UK, 1995.

Polymorphic properties of palm oil and hydrogenated palm oil. L. deMan and J.M. deMan. Malaysian Oil Sci. Technol. 7(2): 27-30, 1998.

Ph.D. Thesis. J.R. Fabien Univ. of New South Wales, Australia.

Chemical interesterification of olive oil-tristearine blends for margarines. Gavrilidou and Boskou. Int. Journal of Food Science and Technology. 26: 451-456, 1991.

Preparation and properties of low *trans* margarines and oils by interesterification, blending and genetic modification. List, Orthoefer Warner and Neff. In: Physical Properties of Fats, Oils and Emulsifier. pp. 226-237. AOCS Press, 2000.

Interesterified palm products for soft type margarines. Teah Yau Kun, Miskander and Yusof Basiron. Proceedings Int. Symposium on new approaches to functional cereals and oils Beijing, 1997.

Polymorphic stability of hydrogenated palm oleins in dilutions with unhydrogenated liquid oils L. deMan, Y.J. Xu, H.S. Chen, J.M. deMan, J. Am Oil Chem Soc. 70: 431-433, (1993).