Summary of Discussion Session B-3 on Hydrogenation and Interesterification

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Discussion session chaired by R.C. Hastert; the panel consisted of Messrs. R. Larsson, H.J. Beckmann, and A.R. Macraw.

The effects of molecular structure and catalyst poisons on the rate of hydrogenation were points of greatest interest in questions concerning hydrogenation. There is no evidence that variation in triglyceride structure produces a change in rate based on a facilitated entry into catalyst pores. However, some investigators have reported that the position of a fatty acid in the triglyceride molecule can affect its rate of hydrogenation. Concerns about the partial hydrogenation of fish oil were voiced, but it was stated that an oil having an iodine value of 110 could be successfully produced using 0.05% nickel catalyst at 170 C and 3 bar. Post-bleaching with 3% activated bleaching earth was required, and catalyst reuse was not recommended because formation of *trans* isomers was increased. Finished oils were found to have a good storability. Catalyst poisons make the hydrogenation of crude oils impractical; however, research indicates that oils which have been pretreated for physical refining can be successfully hydrogenated with appropriate catalyst concentrations. Economic balances will determine the commercial feasibility of such approaches. Observed differences in catalyst activity in hydrogenating soybean oil relative to rapeseed oil were attributed to differences in pore size and nickel content of catalysts and to residual sulfur content of the rapeseed oil.

Potential for commercialization of enzyme-catalyzed interesterification processes received close scrutiny. Application of enzymes is not directly competitive to chemical processes even for value-added products, but emphasis would be on obtaining products not otherwise available. With certain high-value fats, such as cocoa butter, enzyme-catalyzed interesterification of lower cost oils to form an equivalent fat could be competitive, because the natural sources also are expensive. The use of rumen enzymes for hydrogenation processes was not demed practical at this time. It was suggested that economically viable enzyme-catalyzed hydrogenation would require the production of *cis* products, but such specific enzymes are not known at this time.

Summary of Discussion Session B-4 on Finished Products

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Discussion session chaired by T.H. Applewhite; the panel consisted of Messrs. Lefvbre, Leo and Lau.

Several questions were directed toward the formulation of and processing of various types of margarines. J. Lefebvre responded specifying the general conditions (Votator discharge temperatures 60-70 F) for processing various types of margarines (heat rise: 1-2 C for soft; 2-3 C for stick) and outlined the properties required for baking (mp 35-38 C) and puff pastry (mp 37-42 C) margarines. There was much interest in how one might accelerate crystallization of high palm oil margarines but the consensus was that the nature of such blends appeared to make usual approaches ineffective. Several suggestions were advanced including modification of equipment, reduction of processing rates and changes in oil blends to include other oils or interesterification. The tempering requirements (15 C, 10 days) for cake and puff pastry margarines also were discussed.

In the packaging area, there was considerable interest in problems and opportunities involved with plastic packaging. Paneling of oil bottles was discussed by D. Leo as resulting from packing at too high a temperature or from reaction removal of oxygen from an excessive headspace leading to the development of a vacuum. There also was a discussion of sensitizers of light-catalyzed autoxidation and the opportunities for blocking light using special films. Shelf life of oils in various package types was reviewed and the following general approximations were offered: polyethylene—three months; polyvinylchloride—one year; polyethylene-terephthalate—one year; glass—one + years; and tin—two + years. Problems of food safety and flavor related to monomers and other impurities in plastic bottles for oil packaging were discussed at some length with emphasis on PVC and ABS. Some future opportunities in the use of oriented polyethylene or polypropylene for margarine tubs were mentioned.

Audience participation was excellent both in questioning the panelists and sharing experiences and ideas in these key areas of the edible oil business.