similar relationship between thermal expansion and specific heat.

Summary

1. Dilatometric curves between *ca.* —38° C. and temperatures representing the liquid state have been determined for a number of pure triglycerides and some commercial fats.

2. From the dilatometric data and density data on the liquid samples, determinations have been made of the density in both the liquid and the solid states, the expansibility of each state with increase in temperature, and the dilation accompanying melting of the samples. From similar comparative data on the three polymorphic forms of tristearin determinations have been made of the volume changes accompanying transformation from one form to another.

3. Certain relationships are pointed out among the various properties of melting point, density, expansibility, melting dilation, specific heat and heat of fusion, and the relation of these properties to chain length and degree of unsaturation in triglycerides is discussed.

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Tenderness of Pastries Made With Different Soy Flours

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A STUDY to determine the shortening value of fat in different types of soy flour furnished evidence that the fat in the flour is effective as a shortening agent in pastries made with soy flour.

Three series of pastry mixes consisting of 12 variants were set up to show variations in the tenderness in wafers when three types of soy flour containing different percentages of fat were used. In the first series the plastic fat used in the pastry formulas was constant, but the total fat in the pastries varied because of the different amounts of fat in the five flours used. In the second series the total fat in the pastries was constant because the plastic fat added was reduced by the amount of fat present in the different flours. In the third series defatted flour was used, and the total fat in the pastries was constant. In three of the mixes in this series soybean oil was substituted for part of the plastic fat in the formula. The amounts of oil replacing the fat in the formula were equivalent to the amounts present in soybean flours containing 5%, 15%, and 22% fat.

The basic formula used was flour 100, fat 40, and water 60. Mixing, rolling, cutting, and baking conditions were controlled as closely as possible. One hundred wafers from 10 batches of each of 12 variants were broken on the Bailey shortometer, and statistical measures of the breaking strength data were used. These data are given in Table 1 and in Figure 1.

TABLE 1

The Mean Breaking Strengths of the Soy Flour Pastries and Statistical Measures.

	Mean breaking strength	Standard deviation	Standard error of mean	Range for 100 wafers
Series I. Added fat constant; total fat varied	*ounces*			*ounces*
A. Defatted flour	14.6	3.8	1.2	7.5-34.0
B. Extracted flour, 5% fat	11.6	2.2	0.7	5.0-20.0
C. Expeller flour, 5% fat	2.9	0.35	0.1	1.5- 5.5
D. Extracted flour, 15% fat	6.4	0.69	0.2	4.0-11.5
E. Full fat flour, 22% fat	6.6	1.07	0.3	3.5-11.0
Series II. Total fat constant; added fat varied				
A. Defatted flour	14.6	3.8	1.2	7.5-34.0
F. Extracted flour, 5% fat	15.4	3.6	1.1	7.0-36.0
G. Expeller flour, 5% fat	4.4	0.64	0.2	2.5- 8.0
H. Extracted flour, 15% fat	13.7	3.6	1.1	6.0-29.0
I. Full fat flour, 22% fat	19.0	3.5	1.1	9.5-33.0
Series III. Total fat constant; proportion of oil varied				
A. Plastic fat only	14.6	3.8	1.2	7.5-34.0
J. Oil as in flour with 5% fat	15.2	2.9	0.9	7.5-32.0
K. Oil as in flour with 15% fat	14.3	3.3	1.0	7.0-28.0
L. Oil as in flour with 22% fat	12.2	2.9	0.9	7.0-20.5

When like amounts of fat were added in making pastries using extracted soy flours containing different percentages of fat, the mean breaking strength of the pastries was greatest with the defatted flour, less with extracted flour containing 5% fat, and still less with extracted flour containing 15% fat. These differences were "significant" ones. The fat in the flour seemed to be responsible for the decreased breaking strength or increased tenderness of the pastries made of extracted flours containing 5% and 15% fat.

When varying amounts of plastic fat were used in the formulas for pastries with extracted soy flours of different amounts of fat (0, 5%, 15%), adjusting the fat increments so that the total fat in the

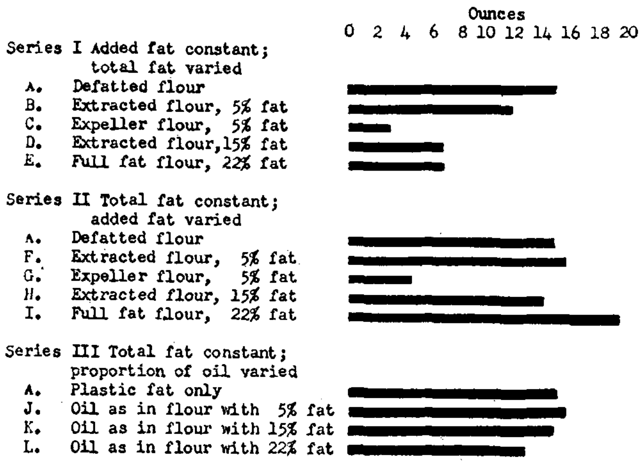

FIG. 1. Mean breaking strengths of 100 soy flour wafers for each variant.

pastries was the same, the tenderness of the different lots of pastries was approximately the same. None of the differences in mean breaking strengths of these pastries was statistically significant. This indicated that the fat in the extracted soy flours containing 5% and 15% fat had approximately the same shortening value as equivalent amounts of plastic fat.

The fat in the extracted soy flours containing 5% and 15% fat shortened as effectively as equivalent amounts of soybean oil mixed with the plastic fat. There were no significant differences in the mean breaking strengths of pastries made with the extracted soy flours containing 5% or 15% fat and the pastries in the third series made with the defatted flour and soybean oil equivalents when the total fat in the pastries was constant.

In comparing a soy flour of the expeller type containing 5% fat with extracted type soy flours, it was found that the pastries made with the expeller flour were much more tender than with the extracted flour of either the 5% or the 15% fat content or even than pastries made with the full fat soy flour containing 22% fat. The differences in mean breaking strengths were highly significant. It seemed that this difference in tenderness must have been caused by some factor other than the fat in the different types of flour.

Abstracts

Oils and Fats

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THE COMPONENT ACIDS OF THE TESTA AND KERNEL FATS OF THE OIL PALM. H. A. Carsten, T. P. Hilditch and M. L. Meara. *J. Soc. Chem. Ind. 64,* 207-9 (1945).

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N.D.G.A. Editorial. *Ind. Eng. Chem. 37,* No. 8, 12, 14 (1945). Historical developments.

THE COEFFICIENT OF CUBIC EXPANSION OF DOGFISH LIVER OIL, RATFISH LIVER OIL, SALMON OFFAL OIL AND HALIBUT LIVER OIL. P. J. Frost. *Prog. Repts. Pacific Biol. Sta. No. 63,* 43-4 (1945). As pointed out in previous articles and as upheld in this investigation, the universal use of the coefficient of cubic expansion, 0.000404/°F., will lead to considerable error when calculating the volume change of fish liver and body oils in bulk. The coefficient of cubic expansion per degree F. was measured for fish oils in various temperature ranges between 14 and 120°F. These varied between 0.000413 and 0.000922.

THE USE OF LOW-TEMPERATURE CRYSTALLIZATION IN THE DETERMINATION OF COMPONENT ACIDS OF LIQUID FATS. I. FATS IN WHICH OLEIC AND LINOLEIC ACIDS ARE MAJOR COMPONENTS. T. P. Hilditch and J. P. Riley. *J. Soc. Chem. Ind. 64,* 204-7 (1945). Preliminary separation of mixed fatty acids by crystallization from solvents at low temperatures, according to the technic of J. B. Brown and his colleagues, is preferable to lead salt separation in the cases of fats which contain only small proportions of saturated acids. The procedure, coupled with subsequent ester-fractionation, has been applied to the acids of sunflower seed, sesame and groundnut oils (all of which have oleic and linoleic acids as their major components). The results agree well with earlier analyses in which lead salt separation had been employed.

COMPARISON OF VARIOUS METHODS USED FOR DETERMINATION OF FAT IN POWDERED MILK, CONDENSED MILK, CHEESES AND ICE CREAM. Jose Luis Andrade. *Rev. sanidad y asistencia social* (Venezuela) *7,* 561-72 (1942). The method of Weibull, which is applicable in all cases and which gave uniformly satisfactory results, follows: Boil 2.5 g. of the material to be analyzed for 30 min. with 20 ml. HCl (d. 1.19) and 30 ml. distilled water in presence of some pieces of pumice, filter hot through a wet filter and wash the residue with hot (90°) water until filtrate and wash water are free of acidity. Dry the filter and its contents at 105°, place the dried residue in a paper thimble, submit it to the solvent action of ether in a Soxhlet extractor, dry and weigh the residue remaining after the extraction. The fat content is obtained by difference. The Gerber method or simple Soxhlet extraction is applicable only to cheeses. The Babcock method gives approximate results with powdered milk and cheeses. (*Chem. Abs. 39,* 2352.)

STABILITY OF WIJS' SOLUTION IN THE TROPICS. R. Child. *Ind. Eng. Chem., Anal. Ed. 17,* 530 (1945). The writer's experience in Ceylon, where the mean temperature is about 81°F. and relative humidity about 84%, is tabulated. In general the drop in factor has been reasonably regular at approximately 0.00006 *N* per day—that is, the solution during normal use loses about 1% of its strength in a month. Iodine values determined on the same samples of oils using a fresh solution side by side with one 10 months old gave concordant results and the writer is of the opinion that there is no risk in keeping a solution in use for that length of time, if blanks are run each time it is used.

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