tive, and is reproducible. Qualitative identification of components is simplified by quantitative removal of other fatty acids with similar gas chromatographic retention times. Prior fractionation with urea requires more time than routine GLC analysis, but this factor is offset by improvement of detection and estimation of trace components. Separations achieved by urea fractionation are compared with those obtained by column chromatography on silicic acid and fractional distillation reported in the literature.

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SEARCH FOR NEW INDUSTRIAL OILS. XII. FIFTY-EIGHT EUPHORBIACEAE OILS, INCLUDING ONE RICH IN VERNOLIC ACID

R. Kleiman, C. R. Smith, Jr. and S. G. Yates

Seed oil of one species in the plant family Euphorbiaceae, *Euphorbia lagascae* Sprun., contains 57% epoxy acid that has been identified as *cis*-12,13-epoxy-*cis*-9-octadecenoic acid (vernolic acid). The low percentage of trivernolin in the glycerides of *Euphorbia lagascae* oil is in sharp contrast to its occurrence as a major constituents in *Vernonia anthelmintica* oil.

Seed from 57 other species in the Euphorbiaceae have been analyzed for oil and protein contents, and the methyl esters of the derived oils have been analyzed by gas-liquid chromatography for fatty-acid composition. On the bases of these analyses, oils from 28 species contain 50–76% linolenic acid; oils from seven, 62–77% linoleic acid; and oils from three, 55–84% oleic acid. Oils from the remaining species contain lesser amounts of the common acids and no significant amounts of unusual components. Iodine values of the oils range from 87–221.

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COMPOSITION OF CORN OIL

J. B. Beadle, D. E. Just, R. E. Morgan and R. A. Reiners

The composition of commercial corn oil from USA corn is remarkably constant. A total of 103 samples of refined corn oil produced over a period of two and one-half years were analyzed by the alkali isomerization procedure. Average values were:

Iodine Value (Wijs)	Constituent Fatty Acids (% Total Fatty Acids)			
	Saturated	Oleic	Linoleic	Linolenic
123.6	13.7	29.7	55.5	0.6

Nearly 86% of the samples had an iodine value (I.V.) within a unit of the average; 93% of the linoleic acid values were within 2 units of the average. All samples contained small amounts of linolenic acid. A number of these samples were analyzed by gas-liquid chromatography (GLC). The average linolenic acid content by this method was about 2.5 units higher than that found by the isomerization method. This difference may be due to the fact that GLC responds to all C-18 dienes equally while the alkali isomerization method responds only to conjugabile dienes. Possible sources of error in both methods of fatty acid analysis are discussed.

Although much of our experience has been with the alkali isomerization method, the GLC technique is preferred because it is simpler and yields more information on fatty acid composition. A most important advantage is that determination of the I.V. of the oil serves as a check on GLC results. The I.V. calculated from the GLC results, making allowance for 1.25% unsaponifiables in the case of corn oil, should be within a few units of the Wijs value.

Oils derived commercially from corns grown in other countries are generally more saturated than those from USA corn. The I.V. of the samples examined varied from 107–125, the linoleic acid contents from 42–56%. The relationship between I.V. and linoleic acid content established by others from hydrid corns holds fairly well for these samples.

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COUNTERCURRENT DISTRIBUTION OF ALKALI-ISOMERIZED METHYL LINOLENATE WITH AN ARGENTATION SYSTEM

C. R. Scholfield, R. O. Butterfield, Helen Peters and H. J. Dutton

Linolenic acid was isomerized by heating with potassium hydroxide in ethylene glycol at 165C for 30 min. The isomerized acids were separated into urea-adduct-forming (AF) and nonurea-forming (NAF) fractions. Both were converted to methyl esters and fractionated by countercurrent distribution (CCD) between hexane and 0.2N silver nitrate in 90% methanol. Some of the CCD fractions were further fractionated by low-temp crystallization from acetone.

CCD of the AF fraction produced two main components. The first, with partition coefficient 10.7, is largely trienoate containing triene conjugation. The second, with partition coefficient 2.0, is largely trienoate containing diene conjugation. CCD of the NAF fraction produced the same two components in addition to cyclic esters with partition coefficient 5.0.

The isomerized linolenic acid is estimated to contain 36% trienoic acids with triene conjugation, 50% trienoic acids with diene conjugation, and 14% cyclic acids.

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NEW NONIONIC DETERGENTS DERIVED FROM EPOXIDIZED OILS II

K. L. Johnson

The physical and surface active properties of alkylolamides prepared from methyl 9,10-epoxystearate are discussed. These materials are prepared by reacting methyl 9,10-epoxystearate with a polyoxyethylene alcohol to produce the methyl ester of the hydroxyalkoxypolyoxyether substituted carboxylic acid which is subsequently subjected to aminolysis with diethanolamine.

The properties of the derivatives as a function of the mol wt of the polyoxyethylene alcohol are explored and appear to exhibit critical changes at a value of ca. 500. All the materials thus prepared exhibit higher water solubility than corresponding N,N-di(2-hydroxyethyl)amides and foam somewhat less.

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NEW NONIONIC DETERGENTS DERIVED FROM EPOXIDIZED OILS III

K. L. Johnson and S. E. Tierney

A series of nonionic detergents based on epoxidized sperm oil and various expoxidized lower alkyl esters of unsaturated fatty acids are presented. Materials were synthesized by alcoholysis of the oxirane oxygen in the presence of boron trifluoride. Isopropyl alcohol was used as a solvent to act as an autopolymerization inhibitor. Methoxy polyoxyethylene alcohols were used as the hydrophilic alcohols with which the epoxy compounds were reacted. In addition to the characterization of the reaction and its products, the physical properties and performance characteristics of the various compounds synthesized are presented. Although no data are available at this time it is felt that these materials are definite candidates for biodegradable nonionic detergents.

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THE PREPARATION AND ANALYSIS OF ALKANOLAMIDES

H. D. Russell, H. G. Scholten, R. A. Mount and M. N. Cruse

Fatty diethanolamides are nonionic surface active agents which are widely utilized as foam stabilizers, emulsifiers, viscosity builders, etc., in such products as laundry detergents, dishwashing formulations, shampoos and cosmetics. In order to better understand the commercial reactions used to produce fatty diethanolamides, chemists at the Technical Service and Development Laboratory, Dow Chemical Co., undertook a study of the amide formation reactions: 1) between lauric acid and diethanolamine to produce the "Kritchevsky-type" condensate; and 2) between methyl laurate and diethanolamine, catalyzed with sodium methylate, to produce the high purity or "super" amides. The effects

(Continued on page 44)

Spotlighting the Tall Oil Symposium

J. P. Krumbein

The 1964 Tall Oil Symposium is the second such presentation sponsored by the AOCS, the first having been presented at the 1958 Annual Meeting. The excellent reception of the first symposium, combined with the fact that the tall oil industry has continued its growth rate in the intervening six years, indicates that the time is opportune for a second presentation.

Illustrating the tall oil industry growth rate is the fact that tall oil output in 1957 was 337,000 tons, whereas in 1963 the output was 450,000 tons. Estimated tall oil fatty acid output has increased from 76,000 tons in 1959 to 120,000 tons in 1963. The importance of tall oil fatty acids is therefore most evident.

The symposium program can roughly be divided into several categories, as follows:

1) Production of crude tall oil from skimmings.
2) Use of computers in process operations.
3) Novel equipment which can be used in the distillation of tall oil.
4) Latest advances in gas chromatography, particularly as it pertains to the continuous analysis or monitoring of fatty acid process streams from the distillation operations.
5) End use of tall oil products and derivatives.

Titles and abstracts of the 15 papers included in the Symposium (two sessions) can be found in the Program, beginning on page 4. Papers to be presented have been screened for general interest, and it is believed the Symposium will be of considerable interest to much of the membership.

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