to 50 mg. too heavy, while after standing this length of time it will have settled to normal condition and weight. The loss shown by this weighing gives the amount of fat extracted. The flasks are more easily cleaned by chemical than by mechanical means, thus also avoiding any danger of breakage. The bulk of the fat is removed by means of a hot strong solution of sodium hydroxide, the flask rinsed and the remaining fat removed by hot strong sulphuric acid.

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The Esterification of Certain Higher Fatty Acids on Evaporation of Their Alcoholic Solutions.—In an article by one of us[1] on the solubility of stearic acid in alcohol, attention was called to the fact that the solubility of stearic acid was apparently greater after evaporation from alcoholic solution than before. It was thought that this might be due to the presence of alkaloids in the alcohol, or to esterification. It was found, however, that the acid still showed the increased solubility when evaporated from alcohol which had been treated so as to insure the absence of alkaloids. This made esterification a probable explanation. As interaction between this acid and alcohol, on simple removal of the latter by evaporation, had not been previously noted, it seemed desirable to ascertain whether titration of the acid with a standard alkali before and after evaporation with this solvent would give confirmatory evidence.

Stearic acid was first tried with sodium hydroxide. The average of the results showed that less alkali was required for neutralization after evaporating the acid with alcohol than before. The difference, however, was small, and less than the extreme variation among the individual results in each series. The end point was very unsatisfactory, partly due to the suppression of the color of the phenolphthalein by the alcohol, and partly to the opalescence of the solution at the close of the titration.

Better results, given below, were obtained with palmitic acid and potassium hydroxide, though the end point was still rather difficult to observe with certainty. The titrations in all cases were finished in a solution containing 55 per cent. alcohol, as the results of A. Canitz[2] indicate that no appreciable hydrolysis of the soap was to be expected in alcohol of this strength. The palmitic acid was Kahlbaum's best grade, but, as shown by the melting point and titrations, it was not entirely pure. The alkali was made by precipitating a saturated solution of c. p. barium hydroxide with potassium sulphate, using a very slight excess of the latter. It was standardized against hydrochloric acid, which in turn was stand-

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[1] THIS JOURNAL, **27**, 1750.

[2] *Ber.*, **26**, 400.

ardized by the silver chloride method, as described by C. G. Hopkins.[1] The alcohol was the "95 per cent." of commerce, distilled from potassium hydroxide, and was neutral. The water used was freed from carbon dioxide and ammonia. Standardized burettes were used, and corrections were made for temperature. The "evaporated" samples were prepared by dissolving the acid in 70 cc. of alcohol and immediately removing the solvent by placing the flask in a hot water bath. The evaporation of the alcohol requires usually about one hour. For titration the weighed acid was dissolved in sufficient warm alcohol to give finally, with the aqueous alkali used for neutralization, a 55 per cent. (alcohol) solution. To permit a more ready comparison, there is given for each titration the number of cc. of alkali which a 1 gram sample would have required.

TABLE I.

Palmitic acid. Potassium hydroxide, strength 0.00449 per cc. Indicator, phenolphthalein. Samples all evaporated.

Weight of acid in grams...	0.9954	0.9731	0.9681	1.0504	0.9824	0.8932	0.9022	1.0245
Cc. of alkali required...	48.20	47.18	46.83	50.83	47.44	43.27	43.68	49.53
Cc. calculated for 1 g. acid	48.42	48.48	48.38	48.39	48.29	48.44	48.41	48.34

Average calculated values, 48.39 cc.

TABLE II.

Reagents and indicator same as above. Samples not evaporated.

Weight of acid in grams	0.8424	0.9474	0.9371	0.6636	1.0045	0.8951	0.8410
Cc. alkali required....	40.83	45.96	45.48	32.23	48.78	43.53	40.78
Cc. calculated for 1 g. acid...............	48.46	48.54	48.53	48.57	48.56	48.63	48.49

Average calculated values, 48.54 cc.

One gram of pure palmitic acid would have required theoretically 48.70 cc. of the above alkali. The results therefore indicate about 0.3 per cent. impurity in the original acid (Table II.), and the difference between Table II and Table I indicates about 0.3 per cent. esterification.

During the progress of the above work, a paper appeared by W. R. Orndorff and J. A. Black on "Phenoltetrachlorphthalein and Some of Its Derivatives," in the *Amer. Chem. J.*, **41**, 349, in which it was stated that this substance is superior to phenolphthalein as an indicator, especially for organic acids and in alcoholic solution, the color being less suppressed by alcohol. In response to our request, Dr. Orndorff kindly sent us a sample of the new indicator. We also found that the color change was easier to observe, and the following titrations were made with it:

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[1] THIS JOURNAL, **23**, 727.

TABLE III.

Kahlbaum's stearic acid. Potassium hydroxide, strength 0.00499 g. per cc. Indicator, phenoltetrachlorphthalein.

Weight of acid in grams evaporated	1.1086	0.9967
Weight of acid in grams not evaporated		0.9778
Cc. of alkali required	47.71	42.81
Cc. of alkali required		42.21
Cc. calculated for 1 gram acid	43.04	42.96
Cc. calculated for 1 g. acid		43.17
Average, 43.00 cc.		

These results agree with those given above for palmitic acid in showing that slight esterification takes place—sufficiently to require consideration in certain cases.

As might have been expected, samples subjected to long-continued treatment with boiling alcohol showed decided esterification. For example, a sample of palmitic acid so treated with alcohol for 8 hours required 0.69 cc. less alkali than before boiling, while another, after 24 hours' treatment, required 0.84 cc. less of the alkali.

W. H. EMERSON AND H. N. DUMAS.

NEW BOOKS.

Colloids and the Ultra Microscope. By RICHARD ZSIGMONDY. Translated by JEROME ALEXANDER. 238 pp. John Wiley & Sons. Price, $3.00.

The subject of the colloidal state has within the past ten years grown to be almost another such active offspring of physics and chemistry as physical chemistry itself. It has quickly incited the active interest of scientists in many apparently remote fields, and to-day it demands the attention of both the pioneer investigator and the practical manufacturer. Through glue and glass, through geology of chert and coagulation of blood corpuscles, it clears a new and interesting way. There has been great need of a comprehensive treatise on the subject in English, and this first book of Zsigmondy's seems adapted to partly fill the requirements. An introduction of ten pages points to the differences between solutions proper and the colloidal state, which forms also the subject of Chapter I. Continuation of this attempt at clarification of definition through Chapter II leads to the introduction, for the first time, of many facts known to the colloid chemist, but which might have been better postponed until the inquiring reader had learned some of the results of the numerous investigations which are described much later in the book. Chapter III, comprising 60 pages, could be read before the others to advantage, by a novice, as it contains much of the important early work. Graham's remarkable publications are well given quite fully. Chapters IV, V, VI and VII are devoted to the ultra micro-