be clearly understood that the methods described are purely preliminary and have no official status.

Summary

A method has been developed by which spectrophotometrically measured glycerine color can be expressed in terms of Lovibond units. The yellow and red color values are determined, by means of two statistically derived linear relationships, from optical density measurements at 440 mμ and 520 mμ, respectively. The conversion from spectrophotometric data to Lovibond color units may be done graphically and the results are at least as reliable as the results of repeated visual measurements.

Acknowledgment

We are pleased to acknowledge the assistance of the cooperating laboratories of Armour and Company, Colgate-Palmolive-Peet Company, Procter and Gamble Company, Swift and Company, and Lever Brothers Company.

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The Effect of a Non-ionic Detergent on the Detergency of Alkylaryl Sulfonates and Soap in Hard Water*

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Introduction

IT has been recognized for many centuries that soap has certain deficiencies as a detergent in hard water. During the past two or three decades much research has been devoted with considerable success to the development of detergents which overcome the less desirable properties of soap in hard water. Among these latter products of promise are the non-ionic detergents. One purpose of this paper is to show the effect of one of these non-ionic detergents on the detergency of soap. It has likewise been known for several years that the alkylaryl sulfonate type of detergent, although excellent for many applications, is deficient in detergency for the washing of cottons. In spite of this deficiency the alkylaryl sulfonates foam profusely whereas the non-ionics are generally not good foam producers. Consequently a second purpose of this paper is the determination of the effect of a non-ionic on the detergency of alkylaryl sulfonates in the washing of cotton.

The employment of synthetic detergents with soap has not received great attention. McDonald (1) described some experimental work on a salt water soap which contained admixtures of soap with synthetic detergents, including some non-ionics. Recently, Barker (2) reported some preliminary results on the effect of certain non-ionic detergents on the detergency of the alkylaryl sulfonates. The purpose of this paper is to present new data on the effect of a non-ionic detergent, Renex,[1] a polyoxyalkylene derivative of mixed fatty and resin acids, on the detergency of the two major groups of anionic detergents, soap and alkylaryl sulfonates, as measured in the laboratory.

In view of the predominant importance in both commercial and home laundering of cotton washing, the evaluation of detergent systems has been devoted principally to this fabric. There are many methods of measuring detergency in the laboratory, but most of them consist of removing from a fabric a synthetic soil composed of carbon and some form of oil or grease by washing in a laboratory machine. The present study was conducted by washing a synthetically soiled cotton muslin with a detergent solution in a Launder-O-Meter type machine. The detergency is measured by determining the light reflectance of the soiled fabric before and after washing. The detergent efficiency is calculated by the following formula:

$$\text{Detergent efficiency} = \frac{R_w - R_s}{R_o - R_s} \times 100.$$

Where R_w = Reflectance of the washed fabric
R_s = Reflectance of the soiled fabric
R_o = Reflectance of the unsoiled, unwashed fabric.

In this discussion Relative Detergent Efficiency is the ratio of the efficiency of one detergent system relative to the efficiency of any other detergent system taken arbitrarily as 100.

EXPERIMENTAL

Preparation of Standard Soiled Fabric

One of the most influential factors in detergent testing is the character and method of preparation of the soiled fabric. The standard soiled fabric used in this study is essentially that of Vaughn and Smith (3). The principal differences are dictated by the smaller scale of operations.

In this work strips, 10 in. x 120 in., of a standard muslin are immersed in a 0.1 N sodium hydroxide solution and maintained in it for two minutes. The strips of fabric are then rinsed three times in distilled water at 80°C. for five minutes each time. The fabric is then placed in a solution of 15 g. of sodium stearate and 3,300 ml. of distilled water (at 80°C.) and are thus washed at that temperature by gentle stirring for two minutes. After having been washed, the fabric is rinsed three times at 80°C. and three times at room temperature in distilled water for five minutes each time. The clean fabric is squeezed through the rolls of a washing machine wringer and ironed immediately. Care is taken during these operations to maintain the cloth submerged below the surface of the solutions, and the solutions are stirred frequently to obtain thorough washing and rinsing.

* Presented at the 22nd fall meeting, American Oil Chemists' Society, New York City, Nov. 15-17, 1948.

[1] Registered Trade Mark, Atlas Powder Co., Wilmington 99, Del.

The desized strips of cloth are cut in half so that four strips of 10 in. x 60 in. are obtained. A soiling solution is prepared consisting of 15 liters of tap water (35 p.p.m. $CaCO_3$ equivalent hardness), 180 g. Shell Virgo 38 P, and 125 g. Black Dispersion No. 10 (Binney and Smith Co.). The soiling mixture is placed in a Maytag washing machine and the four desized strips of fabric are added and agitated in the machine for 1.5 hours. At 15-minute intervals the machine is stopped and the cloth strips are disentangled. The soiled cloth is squeezed through a wringer and stretched on a curtain stretcher to dry. The dry cloth is cut to size of 4.5 x 5.25 inches and stored in a desiccator until used.

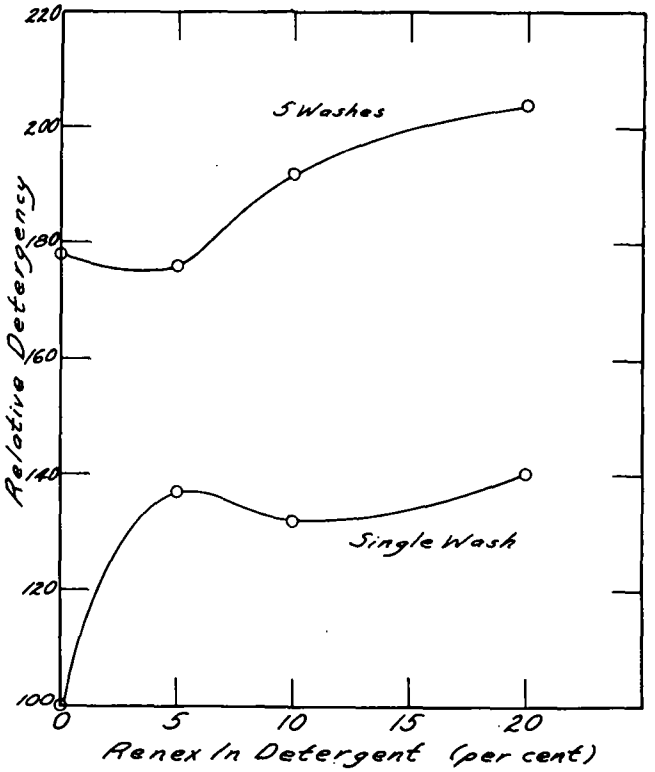

FIG. 1. Effect of Renex on the detergency of alkylaryl sulfonate A in 300 p.p.m. hard water.

The test procedure for evaluating the detergency is as follows: A solution of the detergent system under study is prepared at the desired concentration in water of the required hardness. One hundred milliliters of this solution are placed in each of two 1-pint Launder-O-Meter jars. The jars are placed in the Launder-O-Meter type washing machine and allowed to stand until the temperature of the detergent solution reaches 120°F. ± 2°F. at which temperature the tests are conducted. Twenty stainless steel balls (¼ in. diameter) are placed in each jar, after which one piece of the standard soiled cloth measuring 4.5 x 5.25 in. is added to each jar. Immediately after placing the soiled swatches in the jars, the machine is started and allowed to run for 10 minutes at a speed of 40 r.p.m. The jars are removed from the Launder-O-Meter and the washed fabric immediately removed and placed in 200 ml. of rinse water. The cloth is then put through the washing machine wringer and the rinsing procedure is repeated four more times. In the case of multiple washings the fabric is rinsed only twice between each washing and five times after the final washing. The reflectance of the soiled fabric is measured before and after washing with a Hunter Reflectometer.

Effect of Renex on the Detergency of Alkylaryl Sulfonates in Washing Synthetically Soiled Cotton Fabric in Hard Water

Laboratory washing tests were made to determine the effect of Renex, a non-ionic detergent, on the detergency of three commercially available alkylaryl sulfonates, hereafter designated A, B, and C, in washing soiled cotton according to the procedure described in a previous section. These detergents are sulfonated alkylbenzenes in which the alkyl group contains from

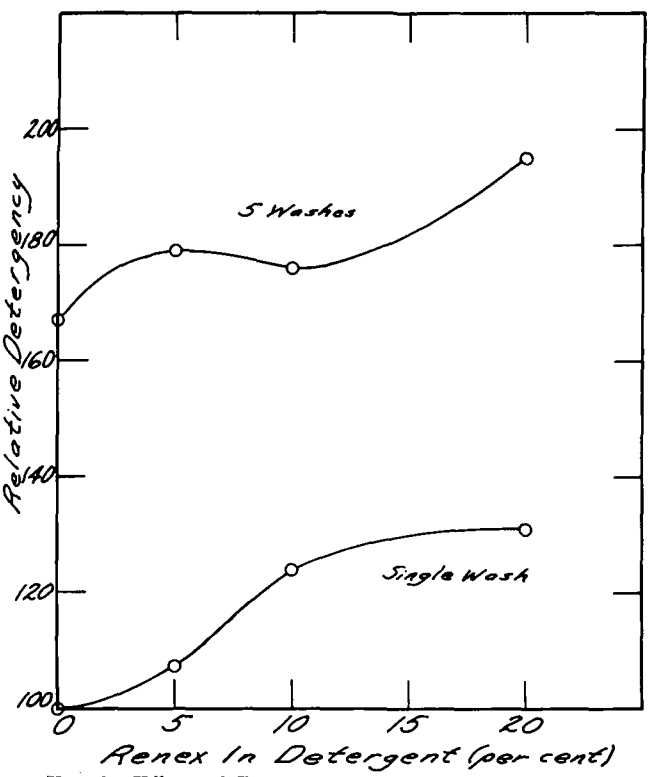

FIG. 2. Effect of Renex on the detergency of alkylaryl sulfonate B in 300 p.p.m. hard water.

9 to 16 carbon atoms. The data are presented in Figures 1, 2, and 3. In each case, the detergency of the particular alkylaryl sulfonate is taken as 100 and the difference in detergency observed when a portion of the alkylaryl sulfonate is replaced with Renex and is calculated relative to the detergency of the former. Examination of the three graphs shows a marked improvement in detergency when the alkylaryl sulfonates are partially replaced with Renex: the curves are somewhat different for each of the three products but each one shows the same overall effect.

In order to determine whether this improvement in detergency remained when the products were used with alkaline builders and detergent promoters, two formulations were prepared varying only in the replacement of one-half the alkylaryl sulfonate by Renex. The laboratory washing data are presented in Table I. It is quite evident that the combined Renex and alkylaryl sulfonates, when built according to the formula given, are superior to the alkylaryl sulfonates alone and built in the same way.

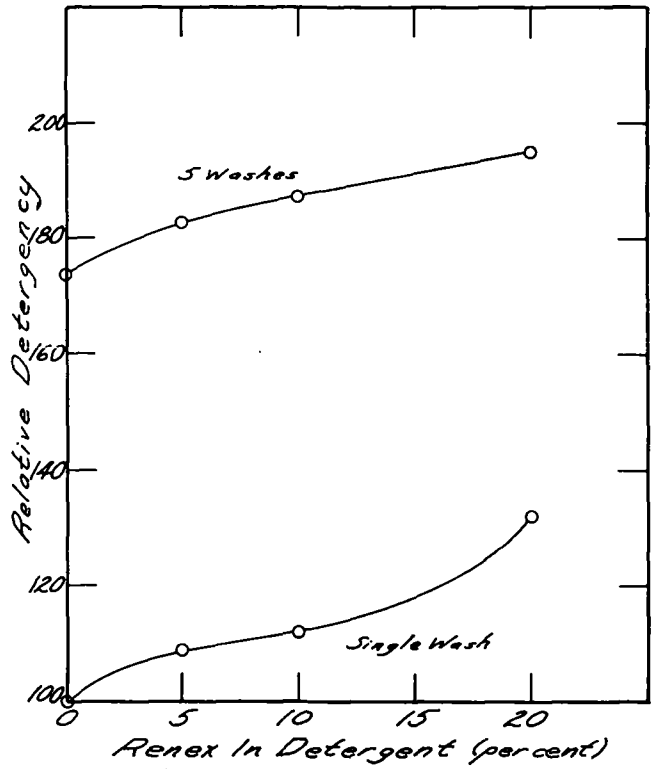

FIG. 3. Effect of Renex on the detergency of alkylaryl sulfonate C in 300 p.p.m. hard water.

TABLE I

Effect of Renex on the Detergency of Built Alkylaryl Sulfonates in Washing of Synthetically Soiled Cotton in Hard Water

Composition	Concentration (per cent)	Relative Detergency
Alkylaryl sulfonates	0.25	100
21% Alkylaryl sulfonates 1% Sodium carboxymethyl cellulose (low visc.) 9% Water 15% Tetrasodium pyrophosphate 54% Sodium sulfate (anhydrous)	0.25	117
10% Alkylaryl sulfonates 10% Renex (a non-ionic detergent) 1% Sodium carboxymethyl cellulose (low visc.) 9% Water 15% Tetrasodium pyrophosphate 55% Sodium sulfate (anhydrous)	0.25	168

Effect of Renex on the Detergency of Soap in Washing Synthetically Soiled Cotton Fabric in Hard Water

The washing of synthetically soiled fabric in the laboratory has shown some interesting effects when Renex replaces a portion of the soap. The data are presented in Figures 4 and 5. It is quite evident that in hard water the replacement of even small proportions of tallow soap (88%) with Renex produces a great improvement in detergency. In the case of sodium laurate in hard water, a real, although much smaller improvement is obtained by the replacement of small quantities of this soap by Renex.

Since it has been observed that the relative effectiveness of detergents is sometimes quite different when built, a series of built detergents composed of soap and Renex with builders was prepared and tested. The results are recorded in Tables II and III. In hard water the replacement of half the tallow soap in a built product by Renex increases the detergency substantially. A similar effect is observed when sodium laurate in a built soap is partially replaced with Renex.

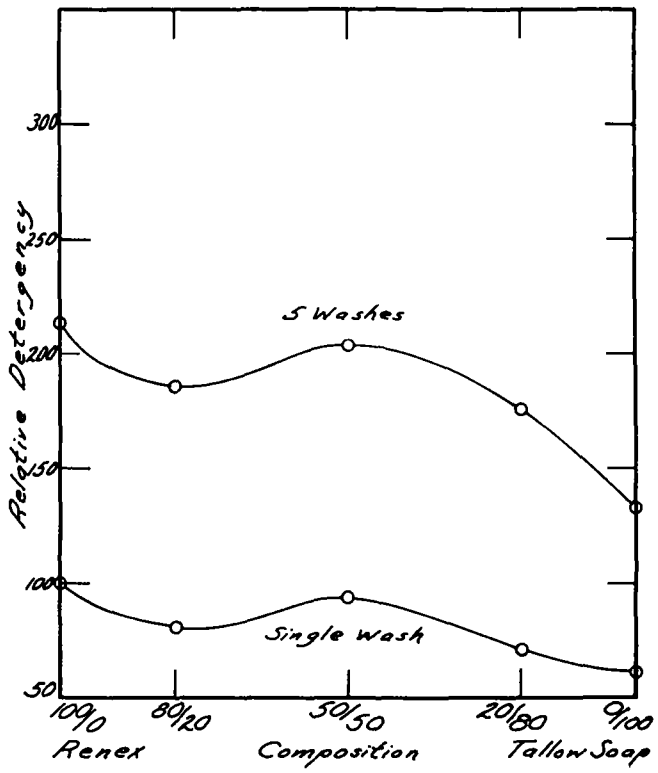

FIG. 4. Effect of Renex on the detergency of tallow soap in 300 p.p.m. hard water.

Conclusions

From the data presented in this paper, it is possible to make certain generalizations with respect to hard water detergency on cotton fabrics.

The replacement of 20% of an alkylaryl sulfonate by Renex produces an increase in detergency of 30 to 40%. This phenomenon applies to sulfonated alkylbenzenes in which the alkyl group contains 9 to 16 carbon atoms. The replacement of half the alkylaryl sulfonates by Renex in a built detergent results in a larger increase in detergency. If Renex is substituted for a portion of sodium laurate, a real but smaller increase in detergency results. When built tallow soaps have a portion of the soap replaced with Renex, they show an increase in detergency. The partial replacement of sodium laurate by Renex in a built soap results in an increase in detergency. These results are perhaps to be expected in as much as soap has always been recognized as a relatively poor detergent in hard water. However, since no practical washing of fabrics is conducted in distilled water, and only a fraction of it is conducted in relatively soft water, the addition of Renex to soap is indicated to produce

TABLE II

Effect of Renex on the Detergency of Built Tallow Soap in Washing Synthetically Soiled Cotton Fabric in Hard Water

Composition	Concentration (per cent)	Relative Detergency Hard Water (300 p.p.m.)
20% Tallow soap 1% CMC (low visc.) 9% Water 55% Sodium carbonate 15% Tetrasodium pyrophosphate	0.25	100
10% Tallow soap 10% Renex 1% CMC (low visc.) 9% Water 55% Sodium carbonate 15% Tetrasodium pyrophosphate	0.25	119

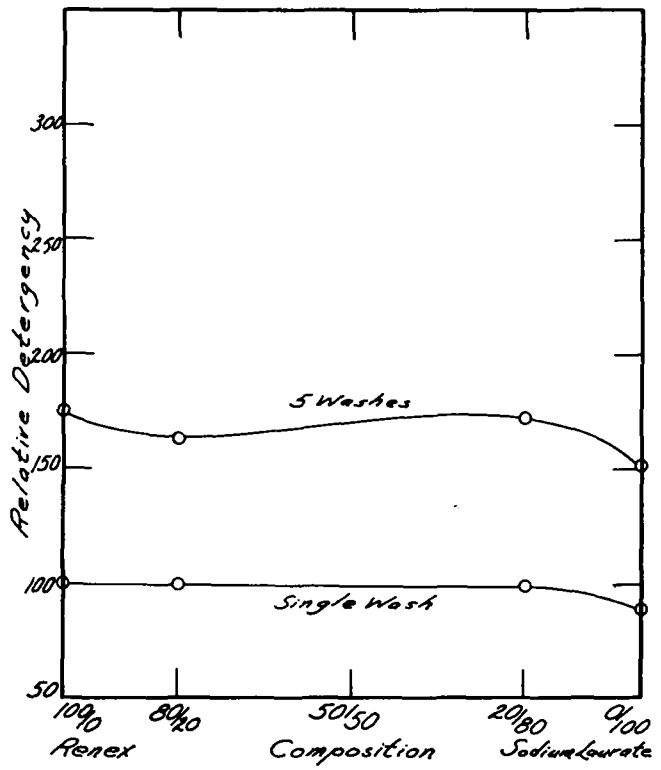

FIG. 5. Effect of Renex on the detergency of sodium laurate in 300 p.p.m. hard water.

a superior detergent for general purpose use, particularly in hard water areas.

Summary

A non-ionic detergent, Renex, has been shown to improve markedly the detergency of alkylaryl sulfonates in the washing of synthetically soiled cotton. This improvement was found to exist also when the alkylaryl sulfonates were built with CMC, salts, and alkalies.

A combination of tallow soap with the non-ionic detergent, Renex, has been shown to have greater effectiveness than tallow soap alone in hard water. Sodium laurate-Renex combinations show less improvement over straight sodium laurate. When Renex replaces half the tallow soap in a formula containing CMC, sodium carbonate, and tetrasodium pyrophosphate as builders, it improves the detergency in hard water. When Renex replaces half the sodium laurate in a formula containing CMC, sodium carbonate, and tetrasodium pyrophosphate as builders, it improves the detergency.

TABLE III

Effect of Renex on the Detergency of Built Sodium Laurate in Washing Synthetically Soiled Cotton Fabric in Hard Water

Composition	Concentration (per cent)	Relative Detergency Hard Water (300 p.p.m.)
20% Sodium laurate 1% CMC (low visc.) 9% Water 55% Sodium carbonate 15% Tetrasodium pyrophosphate	0.25	100
10% Sodium laurate 10% Renex 1% CMC (low visc.) 9% Water 55% Sodium carbonate 15% Tetrasodium pyrophosphate	0.25	119

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Report of the Uniform Methods Committee 1948-49

THIS report briefly summarizes the activities of the Uniform Methods Committee and the 12 technical committees, including their subcommittees, for the past year. Its main purpose is to record action of the Uniform Methods Committee and the Society on any committee recommendations. Wherever the connotation "adopted" or "approved" is used it means that it carried the unanimous approval of the committee recommending, the unanimous approval of the Uniform Methods Committee, and the unanimous approval of the Society unless otherwise noted. Dates in parenthesis denote times of action by the Society, in business session.

Official Natural Bleaching Earth. A 4,000-pound lot of this material that was placed in stock in November, 1947, was anticipated to be a five-year supply. However, this stock was exhausted by November, 1948. This was caused by the great increase in use due to the bleach color basis of trading on crude soybean oil for the first time. Active consideration is being given to start similarly bleach color basis of trading on crude cottonseed oil. This would further increase the demand.

A new lot of 24,000 pounds was prepared through the courtesy of L. A. Salomon and Bro., New York City, sole distributor of XL000 English earth in this country, the material used. It was placed in stock at the Central Scientific Company, Chicago, in April, 1949.

This new material was adopted as official (May, 1949) for use in the official bleaching methods Cc-8a-47 and Cc-8b-47 using 5% (15 grams) instead of the previously prescribed 6% (18 grams). Also approved (May, 1949) was a change in these two bleaching methods to delete mention of earth quantity and insert that the amount used shall be that stated on the label of the can of official earth. Labels will be so printed, carrying the statement of approval of the N.C.P.A. Chemists Committee and the N.S.P.A. Technical Committee when and if this is reported. Also approved (May, 1949) was that the above earth and procedures be recommended to the N.C.P.A. and N.S.P.A. for their approval and use in trading rules.

These changes had to be made because it was found impossible to secure a 24,000-pound quantity of XL000 English earth that was the exact equiva-