increases with iodine concentration and light intensity and decreases with increasing fat concentration. It is affected by temperature also, but to a lesser degree. The influence of light may result from its catalytic effect on the decomposition of a reversible fat-iodine complex.

The reaction appears to be pseudo-first order with respect to the substrate but is complicated by side reactions which inactivate the catalyst and destroy conjugation.

The reaction occurs, at a measurable rate, with iodine in the dark, or in light without iodine, but no conversion takes place without iodine in darkness.

The isomerization reaches an equilibrium when approximately 71% of the conjugation present is in the *trans-trans* form. This equilibrium can be attained by starting with either *cis-trans* or *trans-trans* material. Very little, if any, *cis-cis* isomer is present in the equilibrium mixture.

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# A Report from the Refining Committee

At the fall meeting of the Refining Committee of the American Oil Chemists' Society in 1957 questions were raised by one member concerning the refining practice, which has been used by the N.C.P.A. since 1939 (Rule 150), of permitting settlement refining results to be determined on Expeller cottonseed oil by the use of the lye usages and strengths specified for hydraulic oil if the seller so chooses. The rules also include settlement refining conditions for Expeller oil, but as higher amounts of stronger lyes are required, these conditions are seldom chosen by the seller. Some evidence was presented to suggest that while the usage of the refining conditions specified for the settlement refinings on hydraulic oil do result in a fully refined oil with hydraulic oil, the current Expeller oil was significantly under-refined when these same refining conditions were used in the settlement refinings of Expeller oils. It was believed possible that in the continuing efforts to improve Expeller oil yields that the intensity of the seed-conditioning treatment prior to expelling may have been increased, resulting in the presence of materials in crude Expeller oil currently that were either at lower levels or absent under the less severe conditioning-treatment of 20 years ago.

If, in fact, this was the situation, it was pointed out that while a refiner currently would still be able to process hydraulic oil in the plant to a loss equalling the settlement result and obtain thereby an oil of low enough bleach color to be usable in light-color products, with Expeller oil he would find it necessary to refine the oil to a loss substantially greater than the settlement loss to obtain a low enough bleach color on such oil to permit its use in shortenings, for instance, without excessive bleaching costs. In other words, while the inherent minimum bleach color of both hydraulic and Expeller oils had been approached by using the settlement refining conditions for hydraulic oil in 1939, this apparently was no longer the case with Expeller oil as produced currently.

The committee agreed that an investigation of the problem should be made. In 1958 nine laboratories analyzed a sample of Expeller cottonseed oil composited from several score of cars from California and Arizona mills, using stronger lyes than would be required by the hydraulic oil refining conditions to determine if such refinings would reveal evidence of under-refining of the Expeller oil. Mean results (the FFA of the sample was 1.3% so that 12° and 14° Baumé lye would be used for the settlement refining under the rules) are shown in Table I.

TABLE I
% Lye

| ° Baumé | 60% | | | 80% | | |
|---|---|---|---|---|---|---|
| | Ref. Loss | Ref. color | Bl. color | Ref. loss | Ref. color | Bl. color |
| | % | *red* | *red* | % | *red* | *red* |
| 16 | 6.616 | 7.394 | 3.359 | 7.291 | 6.466 | 2.934 |
| 20 | 6.133 | 6.813 | 3.025 | 6.772 | 5.808 | 2.446 |
| 24 | 6.752 | 7.338 | 3.084 | 7.400 | 5.566 | 2.168 |

The sharply decreasing bleach color which was found with 80% usage of stronger lyes was accepted as evidence that at least on this sample of Expeller oil the inherent minimum bleach color of such oil could only be obtained by the refiner at the cost of significantly higher refining losses than the settlement loss. Since the hydraulic oil settlement conditions were not run on the oil in question, it was decided to carry out further work. For a measure in terms of bleach color of proper refining of a cottonseed oil, the committee chose the criterion that an oil would be considered fully refined when its bleach color was within 0.2 red of the inherent minimum bleach color of the particular oil.

In the 1959 work nine laboratories each refined four samples of Expeller cottonseed oil representing typical Expeller oils from the Southeast, Valley, Southwest (West Texas), and West Coast areas.

Refinings were made by the hydraulic oil settlement conditions as well as at higher amounts of stronger lyes at each of the oils (including the Expeller oil settlement conditions). Mean results are shown in Table II.

TABLE II

| | 80% | | | 100% | | |
|---|---|---|---|---|---|---|
| | Ref. loss | Ref. color | Bl. color | Ref. loss | Ref. color | Bl. color |
| | % | red | red | % | red | red |
| a) Southeast Expeller Oil (1.6% FFA) | | | | | | |
| Refined by hydraulic oil conditions | | | | | | |
| 12° Bé | 8.40 | 13.53 | 5.24 | ...... | ...... | ...... |
| 16° | 8.18 | 11.98 | 4.74 | 8.56 | 11.20 | 4.28 |
| Refined by Expeller oil conditions + 22° Bé | | | | | | |
| 16° | 8.63 | 10.85 | 4.30 | ...... | ...... | ...... |
| 20° | 9.52 | 9.92 | 3.91 | 10.14 | 9.29 | 3.58 |
| 22° | 10.16 | 9.97 | 3.72 | 10.47 | 9.15 | 3.38 |
| b) Valley Expeller Oil (2.1% FFA) | | | | | | |
| Refined by hydraulic oil conditions | | | | | | |
| 12° Bé | 9.04 | 7.96 | 3.20 | ...... | ...... | ...... |
| 16° | 8.05 | 7.60 | 3.21 | 8.97 | 7.26 | 2.83 |
| Refined by Expeller oil conditions + 22° Bé | | | | | | |
| 16° | 8.96 | 7.05 | 2.66 | ...... | ...... | ...... |
| 20° | 9.62 | 6.65 | 2.57 | 10.85 | 6.21 | 2.22 |
| 22° | 10.17 | 6.52 | 2.35 | 11.39 | 6.14 | 2.09 |
| c) Southwest Expeller Oil (0.8% FFA) | | | | | | |
| Refined by hydraulic oil conditions | | | | | | |
| 12° Bé | 6.97 | 6.50 | 2.87 | ...... | ...... | ...... |
| 14° | 6.79 | 6.46 | 2.60 | ...... | ...... | ...... |
| Refined by Expeller oil conditions + 22° Bé | | | | | | |
| 16° | 7.25 | 5.71 | 2.31 | ...... | ...... | ...... |
| 20° | 7.28 | 5.47 | 2.21 | 7.97 | 5.33 | 2.06 |
| 22° | 7.53 | 5.35 | 2.09 | 8.41 | 5.04 | 1.96 |
| d) West Coast Expeller Oil (1.2% FFA) | | | | | | |
| Refined by hydraulic oil conditions | | | | | | |
| 12° Bé | 6.31 | 6.24 | 2.21 | ...... | ...... | ...... |
| 14° | 6.10 | 5.88 | 2.11 | ...... | ...... | ...... |
| Refined by Expeller oil conditions + 22° Bé | | | | | | |
| 16° | 6.39 | 5.13 | 1.80 | ...... | ...... | ...... |
| 20° | 6.60 | 4.78 | 1.54 | 7.53 | 4.61 | 1.44 |
| 22° | 6.74 | 4.85 | 1.57 | 7.69 | 4.47 | 1.40 |

A comparison of the settlement results on the four oils, using the hydraulic oil-refining conditions now permitted by the rules, and the criterion of this experiment (the lowest loss with a bleach color within 0.2 red above the lowest bleach obtained) is of interest (Table III).

TABLE III

| Oil | Present settlement rule | | Experimental settlement criterion | | Difference in loss | Difference in bl. color |
|---|---|---|---|---|---|---|
| | Loss | Bl. color | Loss | Bl. color | | |
| | % | red | % | red | % | red |
| Southeast | 8.56 | 4.28 | 10.14 | 3.58 | +1.58 | −0.70 |
| Valley | 8.05 | 3.21 | 10.85 | 2.22 | +2.80 | −0.99 |
| West Texas | 6.79 | 2.60 | 7.28 | 2.21 | +0.49 | −0.39 |
| West Coast | 6.10 | 2.11 | 6.60 | 1.54 | +0.50 | −0.57 |

These results confirm the conclusion of the earlier work of the committee, reported in September 1958, that the use of hydraulic oil refining conditions on current Expeller oils for settlement purposes (Rule 150) results in a substantial under-refining of the oil compared to the requirements of commercial practice.

Examination of the individual data reveals that the experimental criterion of adequate refining was met in all cases by the 16° and 20° Bé results, *i.e.*, the current conditions specified for Expeller oil if the seller does not choose the hydraulic oil conditions. This report is published because it is believed that the work will be of general interest.

D. L. HENRY, chairman

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# Effect of Temperature on Critical Micelle Concentration

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REVIEWS of the literature of critical micelle concentration (cmc) and solubilization by Klevens (6, 8) indicated some of the conflicting views concerning the effect of temperature on these measurements. Since no concise collection of the various statements had been made, these are shown in Table I.

Certainly some of the apparent disagreement may be attributed to the method and conditions chosen for measurement of critical concentration and to the samples investigated. Some ionic surfactants measured by conductivity procedures showed cmc increases with increasing temperature while the converse was found when using the spectral dye method. Results with the latter method were attributed to changes in dye aggregation and not to micelle formation (7).

In cases where the same compounds have been used, a difference in method for measurement may affect the magnitude of the change. In general, it appears that the most marked changes in the measurement value and in cmc occur above 40°C. though here a contrary report (2) appears. Another (3) indicates independence of cmc and temperature, and still another points out for organic liquids that their solubilization is reduced by increased temperature (18). However the general consensus for ionic surfactants seems to be that cmc increases with increase in tem-