James J. Ganucheau (#25), Southern Cotton Oil Company, New Orleans, La.

J. S. Sandifer (#69), Swift and Company, Fort Worth, Tex.

W. Stewart (#73), Swift and Company, Atlanta, Ga.

Honorable mention was awarded to the collaborator having the second highest grade this year, H. L. Arrington (#4), Procter and Gamble Manufacturing Co., Portsmouth, Va.

R. A. DECKER
F. R. EARLE
J. R. MAYS
A. S. RICHARDSON
S. J. RINI
J. P. HEWLETT, chairman

Subcommittee on Glycerine

Two glycerine samples were distributed during the year. One was a C. P. product, and the other was a crude. The C. P. product was analyzed for specific gravity, glycerol (Method Ea 6-51), and moisture (Ea 8-50). The crude product was analyzed for ash, alkalinity, salt, total residue at 160°C., organic residue at 160°C., glycerol (Method Ea 4-38), and glycerol (Method Ea 6-51).

This was the first year for the glycerine series, and 24 collaborators signed up for the work. Nineteen reported their results. The calculated standard deviations on the test were:

C. P. Glycerine

Glycerol (Ea 6-51)	0.47
Sp. Gr. (Ea 7-51)	0.0003
Moisture (Ea 8-51)	0.26

Soap Lye Crude

Ash	0.29
Total alkalinity	0.08
Salt	0.21
Total residue	0.76
Organic residue	0.67
Glycerol (Ea 4-38)	0.47
Glycerol (Ea 6-51)	0.57

The detailed report mailed by your chairman also showed the following:

1. Free alkalinity, combined alkalinity, and carbonate as reported by five laboratories on the crude sample.
2. Glycerol by the dichromate method (Ea 5-38) on both samples as reported by 10 laboratories.
3. A questionnaire to the collaborators as to their interest in a similar program next season and to get their ideas on the number and type of samples desired. This will aid in future planning.
4. The standard deviations on samples distributed in 1952 and 1953 for comparison with those this year (1952-53, Report of the Glycerine Analysis Committee).

The collaborators' results were not graded, and no certificates were issued this year.

B. A. SCHROEDER
C. P. LONG
W. D. POHLE, chairman

Subcommittee on Tallow and Grease

Five samples of tallow and grease were distributed to 55 collaborators. The tests requested were free fatty acid, color, titer, moisture, insoluble impurities, unsaponifiable, and refined and bleached color. The collaborators were not graded on color in any category. The F.A.C. color system has proven so inadequate and non-reproducible that determining the true color of a fat, even by a median of the results, was not even feasible.

The subcommittee voted early in the season to ask the collaborators to continue to report the color but to exclude this test in calculating a collaborator's proficiency. The accuracy and interest in the work has again progressed this year.

Smalley certificates of proficiency were awarded to:

H. C. Bennett (#30), Los Angeles Soap Co., Los Angeles, Cal., with a grade of 99.84% in first place.

J. S. Boulden (#2), Lever Bros. Company, Baltimore, Md., second with a grade of 99.52%.

Honorable mention was given to L. I. Clack (#34), Procter and Gamble Company, Hamilton, Ontario, with a grade of 99.32%.

A complete and detailed report was sent to all the collaborators.

DAN L. HENRY
N. W. ZIELS
B. N. ROCKWOOD
K. H. FINK
C. P. LONG, chairman

[Received April 12, 1954]

Report of the Color Committee, 1953-1954

At the Fall Meeting of the Color Committee (Chicago Convention, Fall 1953) the decision was reached to continue the color work along three lines:

1. investigate methods of standardizing the instrument used (Coleman Jr. Spectrophotometer);
2. work on a general method of measuring oil colors independent of any relationship to Lovibond red values; and,
3. develop a method for the determination of the chlorophyll content of edible oils.

The necessity of working on a color method which does not incorporate the shortcomings of the Lovibond system is now generally accepted. Accepted also is the idea that the photometric color equation already established is about as good an equation as can be developed for relating photometric measurements to Lovibond red values. More work along this line would be not only wasted but delay the work along a more desirable direction. Since a paper will be delivered at the Spring Meeting in San Antonio on the determination of chlorophyll, work on that part of the program will be delayed until the paper is available.

Work Done

Five samples were submitted to the committee members for cooperative work. The samples were:

- a refined soybean oil;
- a refined and bleached soybean oil;
- a dichromate solution of approximately the same color as the refined oil;
- a dichromate solution of approximately the same color as the bleached oil;
- a cobaltous ammonium sulfate solution of approximately the same red color (but no yellow component) as the refined oil.

These samples were submitted to the committee with appropriate instructions for adjusting the instru-

TABLE I

Instrument Response
% Transmittance

Lab No.	Nickel Sulfate							Carbon Tetrachloride	
	400	460	510	550	620	670	700	400	700
1	3.0	26.7	73.0	55.0	4.8	1.0	1.2	−99.8	−98.2
2	6.0	27.2	73.5	55.0	5.8	1.4	2.0	99.2	99.2
3	2.3	26.7	73.8	54.2	4.7	1.3	1.9	−99.6	−98.4
4[a]	....[b]	27.8	68.0	55.1	8.8	2.9	2.9	.....[a]	−97.3
5	3.9	24.5	73.1	54.1	5.0	1.1	1.5	−99.9	−99.2
6	4.0	26.6	73.8	55.0	5.2	1.2	1.6	−99.1	−99.0
7	3.6	26.2	73.6	54.7	5.5	1.6	2.0	100.0	−98.0
8	4.4	26.4	74.7	55.0	5.3	1.6	2.0	−99.4	−98.3
9	3.1	24.2	74.0	54.9	5.6	1.0	0.9	−92.2	−95.8
10	4.9	28.1	74.5	56.9	6.0	1.3	1.6	99.8	100.0
11	4.6	27.7	73.4	55.1	6.0	1.6	1.7	100.0	100.0
12	3.2	25.5	73.9	54.2	5.2	1.7	1.5	99.8	100.0
13	3.1	24.9	74.3	54.0	4.9	1.1	1.5	99.7	99.7
14	2.7	24.8	73.9	54.0	4.8	1.1	1.4	99.8	99.6
15	3.3	24.6	73.2	54.0	4.9	1.1	1.5	99.6	99.9
16	5.4	27.1	73.2	54.4	5.7	1.2	1.9	100.0	100.7
17	3.9	27.6	74.1	55.1	5.7	1.5	1.9	−99.7	−98.0
18	4.8	26.6	73.4	53.0	5.0	3.1	1.5	100.0	−97.0
A.O.C.S. specification	Less than 4.0	26.2 ±2.0	73.9 ±1.0	54.8 ±1.0	5.2 ±0.5	1.1 ±0.5	Less than 2.0	99.5-100.5	.....

[a] Photometric results not in averages. [b] Cannot adjust instrument.

TABLE II

Standardizing Solutions
Absorbances

Lab.	Colored Sol—1						Colored Sol—2						Colored Sol—3					
	460	550	620	670	Lov. Red	Photo Color	460	550	620	670	Lov. Red	Photo Color	460	550	620	670	Lov. Red	Photo Color
1	.720	.038	.009	.011	34-3.4	3.3278	1.55	.140	.012	.012	35-7.6	11.5751	.092	.092	.024	.020	2-7.6	6.3919
2	.652	.034	.008	.007	35-3.6	3.1	1.28	.125	.012	.012	35-8.7	10.2	.097	.090	.019	.017	1-7.6	6.2
3	.721	.0269	.0078	.0212	35-2.9	1.930	1.80	.118	.0141	.0224	35-8.0	9.860	.0842	.0896	.0154	.0232	1-8.1	6.657
4[a]	.545	.047	.011	.012	3.5	3.75	.960	.162	.020	.019	8.3	12.28	.096	.099	.027	.022	7.6	6.90
5	.696	.038	.013	.012	40-3.6	3.81	1.46	.135	.012	.013	35-8.6	11.05	.097	.097	.028	.023	7.0	6.74
6	.697	.037	.008	.008	3.0	3.4	1.48	.133	.013	.013	7.8	11.0	.095	.092	.020	.016	7.8	6.5
7	.714	.037	.012	.010	3.3	3.4	1.60	.136	.012	.010	8.2	11.5	.094	.089	.018	.019	7.3	7.1
8	.682	.032	.006	.008	32-3.2	2.9	1.4	.132	.012	.014	35-7.5	10.7	.093	.092	.018	.017	1-7.0	6.3
9	.685	.030	.003	.006	35-3.5	2.8	1.52	.142	.028	.029	35-9.0	11.4	.084	.087	.018	.016	1-7.8	6.7
10	.658	.023	.003	.000	.....	2.53	1.367	.118	.007	.008	.....	9.85	.088	.082	.013	.008	.....	5.89
11	.630	.023	.001	.003	37-3.7	2.29	1.36	.116	.005	.006	35-8.4	9.73	.086	.080	.011	.007	1-8.1	5.78
12	.718	.033	.003	.003	.....	3.12	1.54	.139	.007	.007	.....	11.57	.097	.095	.015	.011	.....	6.80
13	.703	.028	.003	.004	.....	2.77	1.49	.133	.007	.006	.....	11.14	.089	.087	.013	.010	.....	6.15
14	.735	.031	.003	.004	.....	3.00	1.61	.136	.007	.007	.....	11.45	.097	.092	.013	.010	.....	6.51
15	.703	.034	.003	.004	.....	3.26	1.47	.146	.007	.007	.....	11.91	.096	.098	.015	.010	.....	7.00
16	.650	.038	.016	.016	3.0	3.2	1.30	.117	.015	.014	8.0	9.7	.090	.083	.021	.019	7.6	6.7
17	.66	.033	.010	.012	80-3.0	2.9	1.45	.128	.013	.016	10-10.6	10.4	.093	.090	.022	.017	2-7.6	6.3
18	.67	.030	.008	.007	30-3.2	2.9	1.40	.124	.015	.013	35-8.4	10.3	.095	.092	.023	.022	1-7.8	7.4
Av.	.688	.032			3.30		1.475				8.392		.0929				7.608	
						3.022		.1305				10.87		.0899				6.55

[a] Photometric results not in averages.

TABLE III

Oil Measurements
Absorbances

Lab.	Refined Oil XS 275									Bleached Oil XS 276								
	460	550	620	630	670	Lov. Red	Photo Color	Chlorophyll (a)	(b)	460	550	620	630	670	Lov. Red	Photo Color	Chlorophyll (a)	(b)
1	1.55	.137	.045	.046	.094	35-6.8	8.1008	.718	.580	1.10	.042	.012	.010	.008	30-4.0	4.3896	.....	.....
2	1.28	.113	.036	.037	.087	35-6.7	6.1	.748	.592	.955	.037	.008	.008	.005	35-3.9	3.9	−.0449	−.0883
3	1.77	.123	.0382	.0418	.104	70-7.0	6.564	.931	.756	1.15	.0370	.0052	.0069	.0141	35-3.5	3.480	.108	.0212
4[a]	.950	.144	.043	.040	.081	.....	.....	.61	.41	.740	.054	.012	.014	.013	.....	.....	.....	.....
5	1.46	.134	.046	.046	.098	6.6	.....	.778	.640	1.05	.046	.013	.012	.009	4.0	.....	.....	.....
6	1.47	.125	.040	.039	.100	6.8	6.6	.91	.70	1.05	.044	.007	.006	.006	3.5	4.4	0.00	−0.10
7	1.55	.135	.046	.048	.096	7.2	7.9	.72	.61	1.09	.044	.007	.007	.006	4.0	4.4	0.00	0.00
8	1.40	.120	.036	.037	.096	70-6.3	6.2	.88	.68	1.03	.038	.008	.007	.008	70-3.7	3.9	0.01	−0.06
9	1.50	.117	.038	.038	.085	70-7.6	7.4	.70	.55	1.07	.040	.009	.004	.004	35-3.3	4.4	0.00	−0.1
10	1.367	.116	.040	.040	.092	.....	6.44	.77	.64	1.000	.041	.010	.009	.009	.....	4.03	0.00	−0.056
11	1.350	.110	.039	.038	.086	50-6.3	6.18	.719	.592	.960	.040	.010	.010	.010	35-3.9	3.93	0.0	−0.04
12	1.53	.124	.037	.037	.096	.....	6.71	.88	.66	1.17	.038	.005	.004	.004	.....	4.15	0.00	−0.10
13	1.47	.114	.034	.034	.092	.....	6.06	.868	.648	1.10	.035	.004	.003	.004	.....	3.79	.015	.092
14	1.61	.119	.037	.038	.097	.....	6.43	.88	.69	1.22	.037	.005	.004	.004	.....	4.13	0.00	−0.10
15	1.46	.125	.037	.037	.091	.....	6.98	.82	.59	1.08	.038	.004	.004	.004	.....	3.98	0.00	−0.10
16	1.30	.113	.040	.040	.091	6.9	6.1	.75	.64	.96	.039	.010	.010	.014	4.0	3.6	0,06	0.01
17	1.45	.119	.041	.042	.097	50-5.9	6.4	.82	.69	1.00	.037	.009	.009	.013	50-3.1	3.5	.006	.008
18	1.40	.12	.043	.041	.097	70-6.8	6.5	.838	.684	1.00	.038	.010	.005	.009	70-3.9	3.8	.0059	.....
Av.	1.466		.0396		.09406		6.666	.797	.631	1.058			.0070		3.733		.....	.....
		.1214		.03999		6.742					.0395			.0077		3.986		

[a] Photometric results not in average.

TABLE IV

Solution 1 Corrections—460 Millimicrons

	XS 275			XS 276		
	As is	Corr.	4.65^{D}_{460}	As is	Corr.	3.54^{D}_{460}
1	1.55	1.48	6.87	1.10	1.05	3.72
2	1.28	1.35	6.28	.96	1.02	3.61
3	1.77	1.69	7.85	1.15	1.10	3.89
4	.950	1.20	5.57	.74	.935	3.32
5	1.46	1.44	6.70	1.05	1.04	3.68
6	1.47	1.45	6.74	1.05	1.04	3.68
7	1.55	1.49	6.93	1.09	1.05	3.72
8	1.40	1.41	6.55	1.03	1.04	3.68
9	1.50	1.51	7.02	1.07	1.08	3.82
10	1.37	1.42	6.60	1.00	1.05	3.72
11	1.35	1.47	6.83	.96	1.05	3.72
12	1.53	1.47	6.83	1.17	1.12	3.96
13	1.47	1.44	6.70	1.10	1.08	3.82
14	1.61	1.51	7.02	1.22	1.14	4.03
15	1.46	1.43	6.65	1.08	1.06	3.75
16	1.30	1.38	6.42	.96	1.02	3.61
17	1.45	1.51	7.02	1.00	1.04	3.68
18	1.40	1.44	6.70	1.00	1.03	3.64
	Avg. = 1.45			Avg. = 1.053		
	Lov. Red = 4.65^{D}_{460} = 6.74			Lov. Red = 3.54^{D}_{460} = 3.73		

Solution 2 Corrections—460 Millimicrons

	XS 275			XS 276		
	Reported	Corr.	4.59^{D}_{460} Lov. Red	Reported	Corr.	3.50^{D}_{460}
P & G						
1	1.55	1.48	6.79	1.10	1.05	3.68
2	1.28	1.48	6.79	.955	1.10	3.85
3	1.77	1.45	6.65	1.15	.94	3.29
4	.950	1.46	6.70	.740	1.14	3.95
5	1.46	1.48	6.79	1.05	1.06	3.72
6	1.47	1.47	6.75	1.05	1.05	3.68
7	1.55	1.43	6.56	1.09	1.01	3.54
8	1.40	1.48	6.79	1.03	1.08	3.78
9	1.50	1.46	6.70	1.07	1.04	3.64
10	1.37	1.48	6.79	1.00	1.08	3.78
11	1.35	1.47	6.75	.96	1.04	3.64
12	1.53	1.46	6.70	1.17	1.12	3.92
13	1.47	1.46	6.70	1.10	1.09	3.82
14	1.61	1.48	6.79	1.22	1.12	3.92
15	1.46	1.47	6.75	1.08	1.08	3.78
16	1.30	1.48	6.79	.96	1.09	3.82
17	1.45	1.48	6.79	1.00	1.02	3.57
18	1.40	1.48	6.79	1.00	1.05	3.68
	Avg. = 1.47			Avg. = 1.064		
	Red Value = 4.59^{D}_{460} = 6.742			Red Value = 3.50^{D}_{460} = 3.733		
	Lovibond Range 1.7			Lovibond Range 0.9		
	Range 4.59^{D}_{460} Corrected 0.23			Range 3.50^{D}_{460} Corrected 0.66		

ments used and making the desired measurements. The data obtained are shown in Tables I, II, and III, Eighteen instruments were used in obtaining the data.

From Table I it can be seen that 10 out of the 18 instruments met the A.O.C.S. requirements for nickel sulfate and carbon tetrachloride absorbances. Only one instrument (No. 4) was badly out of line. Five of the instruments showed too much stray light, indicating dirt on the optical parts or need for a new lamp. Most of the laboratories reported all of the requested data except when the necessary equipment was unavailable. Only those results with obviously misplaced decimals have been corrected.

Results

Examination of the data reported will show that variations in photometric colors are due principally to spreads in the 550 and 670 readings. While large spreads do occur in the 460 readings, the factor of 1.29 is so small as to make the variations small, except for Laboratory 4. In all the photometric reading averages the data from Laboratory 4 was omitted. The data on solutions 1 and 2 have been used to correct the 460 readings on the two oil samples while the data on all three colored solutions have been used to correct the readings obtained at 550 millimicrons on the oil samples. The results are given in Tables IV and V. Corrections were made as follows:

$$\frac{\text{average absorbance at given wavelength}}{\text{absorbance of colored solution at given wavelength}} \times \text{oil reading} = \text{corrected oil reading.}$$

Table IV shows that the 460 readings can be improved tremendously by the use of a correction or standardizing solution while Table V shows the correction of the 550 readings is less, but definite, with solution 2. Table VI shows what can be done in predicting red values from corrected 460 readings without using any other wavelengths at all. If the data from Laboratories 3 and 4, which show no consistency in their own readings, are omitted, a photometric red value can be calculated with a spread of only 2.0 red units from the mean value and a calculated standard deviation of only about 0.1 red units. These results are indeed promising if a more precise and successful method of instrument correction does not suggest itself after more study is given to the data obtained.

TABLE V

	Sol. 2 Corrections—550 mμ				Sol. 1 Corrections—550 mμ				Sol. 3 Corrections—550 mμ			
	XS 275		XS 276		XS 275		XS 276		XS 275		XS 276	
	Rept.	Corr.	Rept.	Corr.	Rept.	Corr.	Rept.	Corr.	Rept.	Corr.	Rept.	Corr.
P & G	.137	.128	.042	.039	.137	.115	.042	.035	.137	.133	.042	.041
Barrow Agee	.113	.118	.037	.038	.113	.106	.037	.035	.113	.113	.037	.037
Southern Reg.	.123	.136	.037	.041	.123	.145	.037	.044	.123	.123	.037	.037
Law & Co.	.144	.116	.054	.044	.144	.098	.054	.037	.144	.131	.054	.049
Fort Worth Labs.	.134	.129	.046	.045	.134	.133	.046	.039	.134	.124	.046	.043
Westen Cot. Oil	.125	.123	.044	.043	.125	.108	.044	.038	.125	122	.044	.043
Pope	.135	.129	.044	.042	.135	.117	.044	.038	.135	.136	.044	.044
Armour & Co.	.120	.119	.038	.038	.120	.120	.038	.038	.120	.117	.038	.037
Northern Reg.	.117	.108	.040	.037	.117	.125	.040	.043	.117	.121	.040	.041
AOM												
1	.116	.128	.041	.045	.116	.161	.041	.057	.116	.127	.041	.045
2	.110	.124	.040	.045	.110	.153	.040	.056	.110	.124	.040	.045
Coleman												
1	.124	.116	.038	.036	.124	.120	.038	.037	.124	.117	.038	.036
2	.114	.112	.035	.034	.114	.130	.035	.040	.114	.118	.035	.036
3	.119	.114	.037	.036	.119	.122	.037	.038	.119	.116	.037	.036
4	.125	.112	.038	.034	.125	.117	.038	.036	.125	.115	.038	.035
Swift	.113	.126	.039	.043	.113	.095	.039	.033	.113	.123	.039	.042
Corn Products	.119	.121	.037	.038	.119	.115	.037	.036	.119	.119	.037	.037
E. J. Mallen	.120	.126	.038	.040	.120	.128	.038	.041	.120	.117	.038	.037
									Avg.	.121	Avg.	.0395
Range	.034	.021	.019	.012	.034	.063	.019	.024	.034	.023	.019	.014
Exc'l Lab. 4	.027		.011		.027		.011		.027	.023	.011	.010
Lovibond range									1.7		0.9	
Average Lov.									6.74		3.73	

TABLE VI

Calculated Red Values—460 Millimicrons

Lab. No.	XS 275		Dif.	Variation from Av.		XS 276		Dif.	Variation from Av.	
	Sol. 1	Sol. 2		Sol. 1	Sol. 2	Sol. 1	Sol. 2		Sol. 1	Sol. 2
1	6.9	6.8	.1	.2	.1	3.7	3.7	0	0	0
2	6.3	6.8	.5	.4	.1	3.6	3.9	.3	.1	.2
3	7.9	6.7	(1.2)	(1.2)	(.0)	3.9	3.3	(.6)	(.2)	(.4)
4	5.6	6.7	(1.1)	(1.1)	(.1)	3.3	4.0	(.7)	(.4)	(.3)
5	6.7	6.8	.1	0	.1	3.7	3.7	0	0	0
6	6.7	6.8	.1	0	.1	3.7	3.7	0	0	0
7	6.9	6.6	.3	.2	.1	3.7	3.5	.2	0	.2
8	6.6	6.8	.2	.1	.1	3.7	3.8	.1	0	.1
9	7.0	6.7	.3	.3	0	3.8	3.6	.2	.1	.1
10	6.6	6.8	.2	.1	.1	3.7	3.8	.1	0	.1
11	6.8	6.8	0	.1	.1	3.7	3.6	.1	0	.1
12	6.8	6.7	.1	.1	0	4.0	3.9	.1	.3	.2
13	6.7	6.7	0	0	0	3.8	3.8	0	.1	.1
14	7.0	6.8	.2	.3	.1	4.0	3.9	.1	.3	.2
15	6.7	6.8	.1	0	.1	3.8	3.8	0	.1	.1
16	6.4	6.8	.4	.3	.1	3.6	3.8	.2	.1	.1
17	7.0	6.8	.2	.3	.1	3.7	3.6	.1	0	.1
18	6.7	6.8	.1	.1	.1	3.6	3.7	.1	.1	0
	Avg. = 6.7					Avg. = 3.7				
	Avg. Deviation from Mean			0.156	0.081	Avg. Deviation from Mean			0.075	0.100
				= 0.195	0.101				= 0.094	0.125
			Lovibond Range	1.7				Lovibond Range	0.9	
			Photometric Range	0.4	0.1			Photometric Range	0.3	0.2

It seems quite possible that excellent agreement could be obtained between a large number of laboratories if only one or two corrected readings were used. Since the 460 correction factor for an oil of about 6.7 red is different from an oil of about 3.7, the obvious conclusion is that even at the 6.7 level a 25-mm. oil column is too long and that smaller columns or dilution will be necessary. In other words, it will be necessary to examine both darker and lighter oils to arrive at the proper column lengths and dilutions to use over a wider color range.

Conclusions

It may be concluded from the work of the committee during the past year that

1. eight of 18 instruments used in reporting requested data do not meet A.O.C.S. specifications. This conclusion is not necessarily a criticism of the instruments since only two of the instruments gave results materially out of line;
2. the use of standardizing solutions holds promise;
3. the possibility of using readings at only one or two appropriate wave-lengths suggests itself as a practical method of oil grading;
4. additional committee work is necessary not only in the direction so far taken but in other directions which may hold promise of giving precise instrumental color values.

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Polarographic Determination of Titanium in Soap

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TITANIUM can be determined in soap polarographically after it is ashed, fused with potassium bisulfate, and dissolved in 1.0 N sulfuric acid solution saturated with sodium oxalate. The cathodic wave of the diffusion current is well defined and is in direct proportion to the concentration of the titanic ions. The polarographic method was compared with the colorimetric method. The percentage of titanium was substantiated by using the Ilkovic equation.

Mill-type of soaps contain titanium in the form of titanium dioxide, which is added as a whitener, also to make the bar opaque. The amount of titanium dioxide that is added to the soap will usually vary from 1 oz. to 8 oz. per 100 lbs. of soap, depending upon the desired color or opaqueness. In the course of soap analyses it becomes necessary at times to determine the amount of titanium dioxide, and it was with this object in mind that the polarographic method was investigated.

Preliminary Investigation

It was observed by Zeltzer (5) that the titanium gives well-defined waves in 0.1 N sulfuric, nitric, and hydrochloric acids. The wave of the diffusion current is due to the reduction of the titanic ions to the titanous state (5). Adams (1) found that 1.0 N sulfuric acid gives better reproducibility than 0.1 N sulfuric acid. Adams (1) used 8% urea as a maximum suppressor and saturated the solution with sodium oxalate to form the complex ion. The 1.0 N sulfuric acid was used as the electrolyte in the present investigation because potassium bisulfate was used to fuse the sample after it had been ashed. Sodium oxalate was used to form the titanium ion complex. Two other organic acids were investigated as to their complex formation, namely, tartaric and citric acids, but there was no evidence of any advantage over that of sodium oxalate. The use of urea was studied, and it was found that samples containing 8%, 6%, and 0% urea gave the same diffusion currents which caused us to decide