soluble in alkali and was reprecipitated unaltered by acids. A nitrogen determination agreed with the calculated for *benzoyldithioisopropyl carbamate*, $C_6H_5CONHCS.SC_3H_7$.

	Calculated for $C_{11}H_{13}ONS_2$.	Found.
Nitrogen	6.11	6.08

These latter rhodanides are therefore both normal thiocyanates.

NEW HAVEN, CONN.,
April 12, 1902

[CONTRIBUTIONS FROM THE BUREAU OF CHEMISTRY U. S. DEPARTMENT OF AGRICULTURE, No. 45. SENT BY H. W. WILEY.]

REFRACTIVE INDICES OF SALAD OILS—CORRECTION FOR TEMPERATURE.

BY L. M. TOLMAN ARD L. S. MUNSON.

Received April 28, 1902.

IT IS almost always difficult to obtain exactly a definite temperature at which to make readings of refractive indices. A method and factor for making exact correction for this variation and also for making possible recalculations of determinations made at different temperatures is desirable.

Two factors are ordinarily used in this country to make this correction. One, 0.000176[1] for 1° C. for instruments reading index of refraction directly, and 0.55 scale division for 1° C. for the Zeiss butyrorefractometer, which has an empirical scale. As will be seen later, the former is considerably too small, and the latter was determined for butter-fat and is not correct for oils which have higher refractive indices.

As the butyrorefractometer is very largely used in this country, special attention should be called to a satisfactory method for correcting its readings for temperature. It must be remembered, however, that this discussion is limited to oils, and to the very limited number of oils given in Table III. Other substances and oils vary, and require different corrections for temperature. This instrument on account of its simplicity, ease of manipulation, and water jacket has acquired a very wide use but its empirical scale with division of varying value in refractive indices makes correction for temperature difficult and not exact unless, as is shown

[1] Wiley's "Principles and Practice of Agricultural Analysis," Vol. III, p. 334.

later, the scale readings are calculated to refractive indices and the correction factor applied to that, and then the corrected refractive index recalculated to scale division.

Table I[1] illustrates this variation of value of scale division in index of refraction.

TABLE I.

Scale division.	ND.	Difference.
0	1.4220	0.0080
10	1.4300	
40	1.4524	0.0069
50	1.4593	
90	1.4840	0.0055
100	1.4895	

Ten scale divisions from 0 to 10 equal 0.008 in index of refraction while from 90° to 100° they equal 0.0055. From this it is evident that if, as shown from Table III, the change in refractive index for 1° C. is practically a constant, then the change in scale division for 1° C. must be a variable.

Taking from Table III the average change in refractive index for 1° C. 0.000365, we find that it equals 0.46 of a scale division on reading from 0 to 10 on the scale and 0.66 of a scale division from 90° to 100° on the scale. Therefore on oils or fats, other things being equal, those that have a low reading will have a lower correction for temperature in scale divisions than those that have a high reading. This is illustrated in Table II, from readings made on a rape oil.

TABLE II.

Temp. °C.	Scale readings.	Change for 1° C. in scale divisions.	Change for 1° C. in refractive index.
2.8	82.0	0.60	0.000360
21.8	70.5		
21.8	70.5	0.57	0.000360
38.4	61.0		

The change in scale reading for 1° C. decreases as the temperature rises and the index of refraction falls, while the change in refractive index is constant.

This is also shown in columns 7 and 8 of Table III which give the change from the first reading to the second and from the second to the third. The higher the readings, the larger is the change in scale division for 1° C.

[1] Wiley's "Principles and Practice of Agricultural Analysis," Vol. III, p. 342.

TABLE III.

	Oils.	Temperature. 1	First reading. 2	Temperature. 3	Second reading. 4	Temperature. 5	Third reading. 6	Increase 1° C. 7	Increase for 1° C. 8	Change refractive index for 1° C. 9	Remarks.
23605	Olive	3.4°	76.5	22.0°	65.5	37 8°	56.5	0.59	0.57	0.000366	
506	Olive	3.2°	76.0	22.2°	64.8	36.8°	56.5	0 59	0.57	0.000366	
23460	Olive	3.2°	76.0	22.2°	65.0	43.3°	53.0	0.58	0.56	0.000360	
493	Poppyseed	9.0°	82.5	19.9°	75.6	41.0°	63.2	0.63	0.59	0.000369	Gave wide blue band, making it hard to read.
491	Corn	2.8°	84.5	21.8°	73.0	39.6°	62.5	0.60	0.59	0.000366	
498	Sunflower	3.0°	81.0	21.8°	69.5	39.0°	59.5	0.61	0.58	0.000369	
23624	Sunflower	3.0°	81.2	22.0°	70.0	39.0°	60.0	0.59	0.58	0.000364	
496	Rape	2.8°	82.0	21.8°	70.5	38.4°	61.0	0.60	0.57	0.000363	
490	Rape	3.4°	82.2	22.0°	71.0	38.8°	61.4	0.60	0.57	0.000364	
486	Mustard	2.8°	84.5	22.0°	72.5	38.0°	63.2	0.62	0.58	0.000360	
495	Black mustard	3.2°	84.5	22.0°	73.0	39.4°	63.0	0.61	0.57	0.000361	
487	Lard	3.0°	74.5	22.0°	63.4	37.6°	54.6	0.58	0.56	0.000363	
22434	Lard	3.0°	75.2	22.0°	64.0	39.2°	54.0	0.59	0.57	0.000372	
499	Peanut	3.0°	78.5	22.0°	67.2	37.2°	58.5	0.59	0.57	0.000365	
23656	Peanut	3.3°	76.0	22.0°	64.5	44.2°	52.3	0.61	0.55	0.000366	
492	Peanut and cottonseed	3.4°	82.0	22.0°	70.5	42.4°	58.8	0.61	0.57	0.000369	
489	Sesame	3.4°	81.2	22.0°	70.0	38.2°	60.5	0.60	0.58	0.000370	
436	Cottonseed	3.4°	81.5	22.2°	70.0	37.6°	61.2	0.61	0.57	0.000368	
	Average									0.000365	

The oils used were partly of known purity and partly commercial oils which had been tested for adulterants. The temperatures were regulated by a current of water passing through the instrument. As there are no compensating prisms the dispersion of the oils could not be corrected and with some of the oils, especially poppy-seed which has a high dispersive power, considerable difficulty was encountered in making an accurate reading.

In fact with most of these oils there is more or less dispersion which makes an exact reading impossible, which may explain the slight differences in the change in refractive indices, rather than that there is any actual difference. As the change in refractive index for change of temperature is so much more constant than the change in scale division, it gives a much more accurate means of correcting the readings of the butyrorefractometer than can be had by use of any factor of the scale divisions.

The reading in scale division can be calculated into index of refraction, the proper correction for temperature made, and the index of refraction obtained recalculated into scale divisions. This can be readily done by means of a table prepared by Winton.[1]

For corrections for a few degrees one may use the formula

$R = R' - X(T - T')$.

R = reading corrected to T.

R' = reading at T'.

T = desired temperature.

T' = temperature at which reading was made.

X = change in scale division caused by a change of temperature of 1° C.

$X = 0.55$ for butters which read from 40° to 50° on the scale; for oils that read from 60° to 70° it equals 0.58; for oils that read from 70° to 80° it equals 0.62. Olds[2] gave the correction for temperature for olive oil and sweet almond oil, as 0.000364 for 1° C., which agrees very exactly with the results shown in Table III. Some work by J. H. Long[3] corroborates these results. He found that the correction was practically a constant for the oils he examined, but gave a little higher correction, 0.0004. H. R. Proctor,[4] in his work on the relation between the specific gravity and refrac-

1 *Conn. Expt. Station Report* (1900), Pt. 2, p. 143.

2 *Wied. Ann.*, **10**, 542 (1880); Landolt and Börnstein's Tables, p. 207.

3 *Am. Chem. J.*, **10**, 392 (1889).

4 *J. Soc. Chem. Ind.*, **17**, 1023 (1898).

tive index at different temperatures, has a large number of determinations of index of refraction at 15° C. and 60° C.

The following table of temperature corrections has been calculated by the writers from these results. Table IV shows remarkable agreement with Table III.

Oil.	Correction for 1° C. in refractive index.
Linseed	0.00037
Cotton	0.00037
Peanut	0.00037
Corn	0.00036
Sesame	0.00037
Olive	0.00037
Rape	0.00036

From these results it would seem that the correction for change in refractive index for the ordinary fats and oils is very uniform, about 0.000365 for 1° C.

THE PRODUCTION OF ACYLAMINES BY THE INTERACTION OF SODIUM SALTS OF MONOBASIC ACIDS AND AMINE HYDROCHLORIDES.

By Frederick L. Dunlap.

Received May 13, 1902.

During the course of some experimental work, I had occasion to try the action of sodium acetate on aniline hydrochloride. These two compounds reacted quite readily with the production of acetanilide. A brief study of this type of reaction was extended to analogously constituted bodies, the results of which experiments are given in this paper. This reaction was made use of with the sodium salts of acids containing both open and closed chains, and with alphyl- as well as with arylamines.

When the sodium salt of the monobasic aliphatic or aromatic acid is caused to react, under the influence of heat, the reaction proceeds as follows, R and R' being either an alphyl or aryl residue:

$$RCOONa + R'NH_2HCl = R'NHCOR + NaCl + H_2O.$$

In two of the experiments, conditions were varied to see the effect of temperature and mass on the yield of the resulting product, namely, in the cases where calcium and sodium acetates reacted with aniline hydrochloride. In all other cases, reaction