"I. C. T.," Vol. V, p. 123]. Concerning the reliability of Marignac's data, *cf.*, *e. g.*, T. W. Richards and A. W. Rowe [THIS JOURNAL, **43,** 776 (1921)].

NOVEMBER 20, 1935

OTTO REDLICH
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The Vapor Pressures and the Activity Coefficients of Aqueous Solutions of Calcium and Aluminum Nitrate at 25° (Correction)

BY J. N. PEARCE

Shortly after the publication of the paper[1] on "The vapor pressures and the activity coefficients of aqueous solutions of calcium and aluminum nitrate," two of my students discovered an unfortunate error in the activity coefficients of the ions of these salts. This error arose through the use of an erroneous conversion factor for planimeter readings. All of these data have been recalculated and replotted independently by these students, and the results have been checked by the writer. The corrected data are given in the accompanying tables.

In making these calculations we have assumed that the activity of the solvent, a_1, is equal to the relative humidity, or $a_1 = p_1/p_1^0$. The activity coefficients have been calculated by means of the equation of Randall and White,[2] namely

$$\log \gamma = -h/2.303 - 2/2.303 \int_0^{m^{1/2}} (h/m^{1/2})\mathrm{d}m^{1/2}$$

where $h = 55.51 \ln a_1/\nu m + 1$. The value of the integral was determined by means of a polar

TABLE I

VAPOR PRESSURE, ACTIVITY AND FREE ENERGY DATA OF AQUEOUS SOLUTIONS OF CALCIUM NITRATE AT 25°

m	p, mm.	a_1	$h/m^{1/2}$	$\gamma_{\pm}$	$-\Delta\overline{F}_1$, cal.	$-\Delta F_2^{0,1}$, cal.
0.0	23.752	1.0000	1.365	1.0000	....	...
.1	23.659	0.9961	0.8686	0.3894	2.32	...
.2	23.566	.9922	.6075	.3250	4.72	911
.4	23.373	.9841	.4043	.2754	9.53	1849
.6	23.160	.9751	.2861	.2585	14.96	2458
.8	22.915	.9647	.1902	.2574	21.26	2962
1.0	22.638	.9531	.1109	.2644	28.48	3406
1.5	21.868	.9207	−.0159	.2940	48.98	4316
2.0	21.002	.8843	−.0979	.3381	72.88	5077
2.5	20.042	.8438	−.1626	.3971	100.7	5759
3.0	19.107	.8044	−.1976	.4556	129.0	6328
3.5	18.118	.7628	−.2306	.5290	160.5	6868
4.0	17.098	.7198	−.2603	.6171	194.9	7379
5.0	15.008	.6319	−.3125	.8441	272.1	8334
6.0	13.062	.5499	−.3446	1.1240	354.5	9167
7.0	11.260	.4741	−.3677	1.4688	442.4	9917
8.0	9.603	.4043	−.3869	1.9034	536.8	10616
8.3601[a]	9.041	.3806	−.3950	2.0957	572.5	10865

[a] Saturated. $a_2 = 4(\gamma m)^3$.

TABLE II

VAPOR PRESSURE, ACTIVITY AND FREE ENERGY DATA OF AQUEOUS SOLUTIONS OF ALUMINUM NITRATE AT 25°

m	p, mm.	a_1	$h/m^{1/2}$	$\gamma_{\pm}$	$-\Delta\overline{F}_1$, cal.	$-\Delta F_2^{0,1}$, cal.
0.0	23.752	1.0000	2.895	1.000	....	...
.1	23.648	0.9956	1.2315	0.1970	2.60	...
.2	23.500	.9894	0.5790	.1711	6.33	1311
.4	23.235	.9782	.3723	.1291	13.05	2285
.6	22.860	.9624	.1474	.1355	22.69	3363
.8	22.405	.9433	−.0146	.1517	34.61	4313
1.0	21.911	.9224	−.1202	.1718	47.88	5137
1.5	20.386	.8583	−.3382	.2587	90.61	7065
2.0	18.561	.7814	−.5034	.4102	146.2	8845
2.5	16.678	.7013	−.6088	.6382	210.3	10422
3.0	14.860	.6256	−.6762	.9599	278.0	11823
3.1607[a]	14.370	.6050	−.6786	1.0608	297.8	12183

[a] Saturated. $a_2 = 27(\gamma m)^4$.

(1) Pearce and Blackman, THIS JOURNAL, **57**, 24 (1935).

(2) Randall and White, *ibid.*, **48**, 2514 (1926).

planimeter. The remaining symbols of the tables have their usual significance.

IOWA CITY, IOWA RECEIVED JULY 10, 1935

The Preparation of Glass Helices for Use in Fractionating Columns

BY WILLIAM G. YOUNG AND ZENE JASAITIS

The separation of *cis*- and *trans*-2-butene[1] and of crotyl and methylvinyl-carbinyl bromides[2] by means of a column packed with broken glass helices clearly demonstrates that it is possible to carry out quantitative separations on isomeric mixtures with this type of packing and unless the separation requires the maximum possible efficiency it may be accomplished with an inexpensive fractionating column. However, the preparation of these glass helices[3] has been a slow and tedious process requiring considerable skill.

With the coöperation of National Youth Administration students, Messrs. Roland Icke, Robert Kreiss and Lawrence Richards, we have modified the method of winding and breaking the glass helices so that a satisfactory product may be prepared in one-fifth the time previously required.[3c]

Winding the Helices.—One end of the 3.2 mm. steel rod[3c] is held in a loose metal or wood bearing while the other end is fastened to a variable speed laboratory stirring motor which is clamped on a ring stand. The molten Pyrex or soft glass is fed to the rapidly turning steel rod with the right hand, leaving the left hand free to move the blast-lamp along the rod at a uniform speed. With the rod turning at a rate of 380–400 r. p. m., it is possible to make 36 helices 45 cm. long in one hour. The volume of the unbroken helices amounts to 400–425 ml. compared to 150 ml. previously reported,[3c] while the volume of broken helices obtained equals 60 ml. compared to 15 ml. The fiber diameter of the coils may be varied from 0.2 to 0.9 mm. by regulating the speed of the motor and the temperature of the molten glass as it is fed to the winding form. The helices made in this way are uniform throughout and very closely wound.

Breaking the Helices.—The long spirals which are strung on a No. 18 Chromel wire are brought in contact with the hot wire by rubbing a glass rod from one end of the spiral to the other two or three times. The spirals are then broken by gently rubbing a short section between the thumb and forefinger in a direction parallel to its long axis. The resulting product contains 10.5% of helices of less than one-half turn per coil, 6.2% between one-half and three-fourths turns, 8.6% between three-fourths and one turn, 51.5% of one turn, 15.6% between one and two turns and 7.6% about two turns. The spirals turn slightly as they are rubbed against the wire, thus making it possible for the majority of the helices to be one turn or more. Since the rings cling together it is possible to remove everything below three-fourths of a turn by gently shaking 10–15 ml. at a time. Although the product averages slightly more than one turn per coil and is very satisfactory for most purposes its efficiency may be further increased by carefully sorting out the helices of less than one turn as previously described.[3c]

The following data have been obtained for helices made from 6-mm. soft glass rod as described above:

Fiber size, mm.	0.2–0.3	0.3–0.4	0.5
Total volume, ml.	10[a]	10	10
Number of helices	1700	1600	1100
Glass, g.	2.24	3.24	5.26
Vol. of glass, ml.	0.9	1.3	2.12
Surface area, sq. cm.	140	150	170
% of free space	91	87	79

[a] Volumes were measured in a graduated cylinder 12 mm. in diameter.

(1) Kistiakowsky and co-workers, THIS JOURNAL, **57**, 876 (1935).

(2) Winstein and Young, *ibid.*, **58**, 104 (1936).

(3) (a) Wilson, Parker and Laughlin, *ibid.*, **55**, 2795 (1933); (b) **56**, 1396 (1934); (c) Roper, Wright, Ruhoff and Smith, *ibid.*, **57**, 954 (1935).

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