INTERNATIONAL STANDARD 911

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Sulphuric acid for industrial use — Evaluation of sulphuric acid concentration by measurement of density

Acide sulfurique à usage industriel — Évaluation de la concentration en acide sulfurique par mesurage de la masse volumique

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

Prior to 1972, the results of the work of the technical committees were published as ISO Recommendations; these documents are in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 47, *Chemistry*, has reviewed ISO Recommendation R 911-1968 and found it technically suitable for transformation. International Standard ISO 911 therefore replaces ISO Recommendation R 911-1968, to which it is technically identical.

ISO Recommendation R 911 had been approved by the member bodies of the following countries :

Austria	Hungary	Portugal
Belgium	India	Romania
Brazil	Iran	South Africa, Rep. of
Chile	Ireland	Spain
Cuba	Italy	Switzerland
Czechoslovakia	Japan	Thailand
Egypt, Arab Rep. of	Netherlands	Turkey
France	New Zealand	U.S.S.R.
Germany	Poland	Yugoslavia

The member body of the following country had expressed disapproval of the Recommendation on technical grounds :

United Kingdom

The member body of the United Kingdom also disapproved the transformation of the Recommendation into an International Standard.

Printed in Switzerland

Sulphuric acid for industrial use — Evaluation of sulphuric acid concentration by measurement of density

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method for the approximate evaluation of sulphuric acid (H_2SO_4) concentration of sulphuric acid for industrial use, by measurement of density.

2 PRINCIPLE

Determination of the density at 20 °C by means of a hydrometer. Evaluation of the corresponding sulphuric acid (H_2SO_4) concentration.

3 APPARATUS

Ordinary laboratory apparatus and

3.1 Hydrometer, graduated in 0,005 g/ml, calibrated at 20 °C (see ISO/R 649).

3.2 Glass test tube, of capacity at least 500 ml, of diameter at least 25 mm greater than that of the hydrometer (3.1), and of height at least 25 mm greater than the immersion level of the hydrometer.

4 PROCEDURE

4.1 Determination of density

Place approximately 500 ml of the test sample in the glass test tube (3.2). Adjust the temperature of the contents of the test tube to 20 ± 0,5 °C.

Plunge in the hydrometer (3.1) and, as soon as static equilibrium has been reached, verify again that the temperature of the acid is 20 ± 0,5 °C. Read the density indicated on the hydrometer scale.

4.2 Evaluation of sulphuric acid (H_2SO_4) concentration

Read from the table the concentration corresponding to the density indicated on the hydrometer.

5 EXPRESSION OF RESULTS

State the density read on the hydrometer, expressed in grams per millilitre, and the corresponding sulphuric acid (H_2SO_4) concentration obtained from the table.

6 TEST REPORT

The test report shall include the following particulars :

a) the reference of the method used;

b) the results and the method of expression used;

c) any unusual features note during the determination;

d) any operation not included in this International Standard or regarded as optional.

TABLE – **Relationship between density and concentration of equeous solutions of sulphuric acid**

Density at 20 °C	H_2SO_4	Density at 20 °C	H_2SO_4	Density at 20 °C	H_2SO_4	Density at 20 °C	H_2SO_4
g/ml	% (*m/m*)	g/ml	% (*m/m*)	g/ml	% (*m/m*)	g/ml	% (*m/m*)
1,000	0,3	1,205	28,3	1,410	51,5	1,615	70,4
1,005	1,0	1,210	28,9	1,415	52,0	1,620	70,8
1,010	1,7	1,215	29,6	1,420	52,5	1,625	71,2
1,015	2,5	1,220	30,2	1,425	53,0	1,630	71,7
1,020	3,2	1,225	30,8	1,430	53,5	1,635	72,1
1,025	4,0	1,230	31,4	1,435	54,0	1,640	72,5
1,030	4,7	1,235	32,0	1,440	54,5	1,645	72,9
1,035	5,5	1,240	32,6	1,445	55,0	1,650	73,4
1,040	6,2	1,245	33,2	1,450	55,4	1,655	73,8
1,045	7,0	1,250	33,8	1,455	55,9	1,660	74,2
1,050	7,7	1,255	34,4	1,460	56,4	1,665	74,6
1,055	8,4	1,260	35,0	1,465	56,9	1,670	75,1
1,060	9,1	1,265	35,6	1,470	57,4	1,675	75,5
1,065	9,8	1,270	36,2	1,475	57,8	1,680	75,9
1,070	10,6	1,275	36,8	1,480	58,3	1,685	76,3
1,075	11,3	1,280	37,4	1,485	58,8	1,690	76,8
1,080	12,0	1,285	37,9	1,490	59,2	1,695	77,2
1,085	12,7	1,290	38,5	1,495	59,7	1,700	77,6
1,090	13,4	1,295	39,1	1,500	60,2	1,705	78,1
1,095	14,0	1,300	39,7	1,505	60,6	1,710	78,5
1,100	14,7	1,305	40,2	1,510	61,1	1,715	78,9
1,105	15,4	1,310	40,8	1,515	61,5	1,720	79,4
1,110	16,1	1,315	41,4	1,520	62,0	1,725	79,8
1,115	16,7	1,320	41,9	1,525	62,4	1,730	80,2
1,120	17,4	1,325	42,5	1,530	62,9	1,735	80,7
1,125	18,1	1,330	43,1	1,535	63,4	1,740	81,2
1,130	18,8	1,335	43,6	1,540	63,8	1,745	81,6
1,135	19,4	1,340	44,2	1,545	64,3	1,750	82,1
1,140	20,1	1,345	44,7	1,550	64,7	1,755	82,6
1,145	20,7	1,350	45,3	1,555	65,1	1,760	83,1
1,150	21,4	1,355	45,8	1,560	65,6	1,765	83,6
1,155	22,0	1,360	46,3	1,565	66,0	1,770	84,1
1,160	22,7	1,365	46,9	1,570	66,5	1,775	84,6
1,165	23,3	1,370	47,4	1,575	66,9	1,780	85,2
1,170	23,9	1,375	47,9	1,580	67,3	1,785	85,7
1,175	24,6	1,380	48,4	1,585	67,8	1,790	86,3
1,180	25,2	1,385	49,0	1,590	68,2	1,795	87,0
1,185	25,8	1,390	49,5	1,595	68,7	1,800	87,7
1,190	26,5	1,395	50,0	1,600	69,1	1,805	88,4
1,195	27,1	1,400	50,5	1,605	69,5	1,810	89,2
1,200	27,7	1,405	51,0	1,610	70,0	1,815	90,1

NOTE – The data shown in the table have been obtained by graphic interpolation of the data given in *International Critical Tables*, Vol. 3, p. 56, rounded to the first decimal.

ANNEX

ISO PUBLICATIONS RELATING TO SULPHURIC ACID AND OLEUM FOR INDUSTRIAL USE

ISO 910 – Determination of total acidity, and calculation of free sulphur trioxide content of oleum – Titrimetric method.

ISO 911 – Evaluation of sulphuric acid concentration by measurement of density.*

ISO 912 – Determination of sulphur dioxide content – Barium sulphate gravimetric method.

ISO 913 – Determination of ash – Gravimetric method.

ISO 914 – Determination of total nitrogen content – Titrimetric method after distillation.

ISO/R 915 – Determination of iron content – 2,2′-Bipyridyl spectrophotometric method.

ISO 2363 – Determination of oxides of nitrogen – 2,4-Xylenol spectrophotometric method.

ISO 2717 – Determination of lead content – Dithizone photometric method.

ISO 2877 – Determination of chlorides content – Potentiometric method.*

ISO 2899 – Determination of ammoniacal nitrogen content – Spectrophotometric method.

ISO 3423 – Determination of sulphur dioxide content – Iodometric method.

ISO 5792 – Determination of arsenic content – Silver diethyldithiocarbamate photometric method.*

* Applicable only to sulphuric acid.