

รายการอ้างอิง

- C.R. Hendrick and V.W.R. Amarakoon, Processing of Manganese-Zinc Ferrites for High frequency Switch-Mode Power.
- H. Shoj, T. Mochizuki, M. Sato and T. Maeda, A New Power Ferrite for High Frequency Switching Power Supplies. Preceeding of the international conference, 1992, sapan, P 275-279.
- O. Inoue, N. Matsutani, and K. Kugimiya, Eddy Current loss of Mn-Zn Ferrites. Preceeding of the international conference, 1992, Japan, P 1155-1158.
- S. Ootobe and T. Mochizuki, Microstructure of Mn-Zn Ferrites for Power Application. Preceeding of the international conference, 1982, Japan, P 301-305.
- Takeshi Mochizuki, Relations Between Microstruture and Core loss in Mn-Zn Ferrites for Power Applications. Preeding of the international conference, 1992, Japan, P 53-59.
- T. Akashi et. al, Low Loss and Hight Stability Mn-Zn Ferrite. Preceeding of the international conference, 1990, Japan, P 565-572.
- T.G.W. Stijnjes et. al, Effects of Various Substitutions in Manganese Zinc Ferrites. Am. Ceram. Soc. bull, 1990, P 493-500.
- _____ and, J.J.Rolofsma, Low Loss Power Ferrites for Frequencies up to 500 kHz. Am. Ceram. Bull, 1990, P 493-500.
- You Song Kim and S.S. Kwon, New Powder Charaoteristics of Soft Ferrites for Switch Mode Power Supplies. Preceeding of the international conference, 1992, sapan, P 13-18.
- Y. Tsunekawa, Preparation of Soft Ferrite. Am. Ceram. Soc. Bull, 1991, P 123-128.

Y. Yamamoto, T. Kuriyama and A. Makino, Magnetic Properties of Mn-Zn

Ferrite with Fine Grain Sizes for Magnetic Heads. Ferrite :

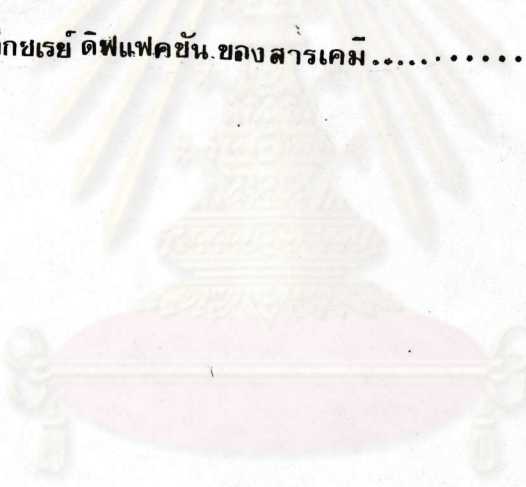
Preceedign of the international conference, 1992, Japan, P 195-204.



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

สารบัญภาคผนวก

ภาคผนวกที่	หน้า
1 Standard Test Method for Apparent Density of Free-Flowing Metal Powder.....	60
2 Standard Test Method for Top density of Powder of Refractory Metal and Compounds by Tap-pak Volumeter.....	62
3 Standard Test Method for Water Absorption, Bulk Density Apparent Porosity and Apparent Specific Gravity of Fired Whiteware Products.....	64
4 ไฟล์นัมเบอร์อิเล็กทรอนิกส์ ของสารเคมี.....	66



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย



Designation: B 212 - 89

Standard Test Method for Apparent Density of Free-Flowing Metal Powders

This standard is issued under the fixed designation B 212; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method describes a procedure for determining the apparent density of free-flowing metal powders and is suitable for only those powders that will flow unaided through the specified Hall flowmeter funnel.

1.2 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

B 213 Test Method for Flow Rate of Metal Powders²

B 215 Practices for Sampling Finished Lots of Metal Powders²

B 243 Terminology of Powder Metallurgy²

3. Summary of Test Method

3.1 A volume of powder is permitted to flow into a container of definite volume under controlled conditions. The weight of powder per unit volume is determined and reported as apparent density.

4. Significance and Use

4.1 This test method provides a guide for evaluation of the apparent density physical characteristic of powders. The density measured bears some relationship to the weight of powder that will fill a fixed volume press cavity when parts are being made. The degree of correlation between the results of this test and the quality of powders in use will vary with each particular application.

5. Apparatus

5.1 *Powder Flowmeter Funnel*³—A standard Hall flowmeter funnel (Fig. 1) having a calibrated orifice.

5.2 *Density Cup*³—A cylindrical cup (Fig. 1) having a capacity of 25 ± 0.05 cm³.

5.3 *Stand*³—A stand (Fig. 1) to support the powder flowmeter concentric with the density cup so that the bottom

of the powder flowmeter orifice is 1 in. (25 mm) above the top of the density cup when the apparatus is assembled as shown in Fig. 1.

5.4 *Base*—A level, vibration-free base to support the powder flowmeter.

5.5 *Balance*, having a capacity of at least 200 g and a sensitivity of 0.1 g.

6. Test Specimen

6.1 The test specimen shall consist of a volume of approximately 30 to 40 cm³ of metal powder.

6.2 The test specimen shall be tested as sampled. Note, however, that moisture, oils, stearic acid, stearates, waxes, etc., may alter the characteristics of the powder.

7. Procedure

7.1 Carefully load the test specimen into the flowmeter funnel and permit it to run into the density cup through the discharge orifice. Take care not to move the density cup.

7.2 When the powder completely fills and overflows the periphery of the density cup, rotate the funnel approximately 90° in a horizontal plane so that the remaining powder falls away from the cup.

7.3 Using a nonmagnetic spatula with the blade held perpendicular to the top of the cup, level off the powder flush with the top of the density cup. Take care to avoid jarring the apparatus at any time.

7.4 After the leveling operation, tap the density cup lightly on the side to settle the powder to avoid spilling in transfer.

7.5 Transfer the powder to the balance and weigh to the nearest 0.1 g.

8. Calculation

8.1 Calculate the apparent density as follows:

$$\text{Apparent density, g/cm}^3 = \text{weight in grams} \times 0.04$$

9. Report

9.1 Results shall be reported as apparent density to the nearest 0.01 g/cm³.

10. Precision and Bias

10.1 The following criteria should be used to judge acceptability of the results at the 95 % confidence level.

10.1.1 *Repeatability*—Duplicate results by the same operator should be considered suspect if they differ by more than 0.9 %.

10.1.2 *Reproducibility*—The results submitted by each of two laboratories should not be considered suspect unless they differ by more than 6.0 %.

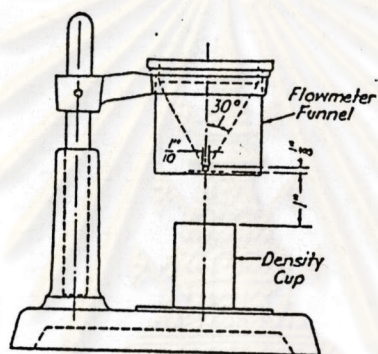
¹ This test method is under the jurisdiction of ASTM Committee B-9 on Metal Powder and Metal Powder Products and is the direct responsibility of Subcommittee B09.02 on Base Metal Powders.

Current edition approved Jan. 27, 1989. Published March 1989. Originally published as B 212 - 46 T. Last previous edition B 212 - 82.

² *Annual Book of ASTM Standards*, Vol 02.05.

³ The flowmeter funnel, density cup, and stand are available from Alcan Powder and Pigments, Division of Alcan Aluminum Corp., 901 Lehigh Ave., Union, NJ 07083-7632.

ASTM B 212



Metric Equivalents


in.	mm
1/10	2.5
1/8	3.2
1	25

FIG. 1 Flowmeter Apparatus

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, PA 19103.

จุฬาลงกรณ์มหาวิทยาลัย

 Designation: B 527 - 85 (Reapproved 1991)¹

Standard Test Method for Tap Density of Powders of Refractory Metals and Compounds by Tap-Pak Volumeter¹

This standard is issued under the fixed designation B 527; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

¹ NOTE—The Keywords section was added editorially, and other editorial changes made, in August 1991.

1. Scope

1.1 This test method covers determination of the tap density (packed density) of refractory metal powders and compounds by means of the Tap-Pak Volumeter.²

1.2 This standard does not purport to address the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Significance and Use

2.1 This test method covers the evaluation of the tapped density physical characteristic of powders. The degree of correlation between the results of this test and the quality of powders in use will vary with each particular application and has not been fully determined.

3. Apparatus

3.1 *Graduated Cylinder*,³ calibrated to contain 25 mL at 20°C, internal diameter 15 mm, height 180 mm and weight approximately 60 g.

3.2 *Holder*—A cylinder holder weighing 1 lb (454 g).

3.3 *Tapping Device*, consisting of a baseplate with single-phase a-c condenser motor, with worm drive, reduction ratio 15 to 1, cam shaft speed 250 r/min, tapping stroke travel 3.2 mm.

3.4 *Counter*—A four-digit adjustable counter, which can be preset to deliver numbers of taps between 1 and 9999.

3.5 *Balance*, having a capacity of at least 100 g and a sensitivity of 0.1 g.

¹ This test method is under the jurisdiction of ASTM Committee B-9 on Metal Powders and Metal Powder Products and is the direct responsibility of Subcommittee B09.03 on Refractory Metal Powders.

Current edition approved Aug. 30, 1985. Published December 1985. Originally published as B 527 - 70. Last previous edition B 527 - 81.

² Tap-Pak Volumeter Model No. JEL ST2 manufactured by J. Engelsmann A.G. of Ludwigshafen a. Rh. West Germany. Available through Shandon Southern Instruments Inc., 171 Industry Drive, Pittsburgh, PA 15275.

³ Corning, No. 3046, Pyrex Brand, has been found satisfactory for this purpose.

4. Test Specimen

4.1 The test specimen shall be 50 g except as noted in 4.2.

4.2 For refractory metal and compound powders too voluminous to fit into the 25-mL graduated cylinder, reduce sample size to 20 g or 10 g, as necessary, and follow the standard procedure.

5. Procedure

5.1 Weigh 50 g of the test specimen to an accuracy of ± 0.1 g.

5.2 Pour the test specimen carefully into the graduated cylinder, using a funnel. To ensure proper level, rotate the funnel while pouring the test specimen.

5.3 Preset the counter for 3000 taps.

5.4 Start tapping device.

5.5 Read the tapped volume, V , in millilitres, by calculating the mean value between the highest and the lowest point at the tapped volume.

6. Calculation and Report

6.1 Calculate tap density in grams per cubic centimetre, to the nearest tenth by dividing 50 g (10 or 20 g for samples as noted in 4.2) by the tapped volume, V , read in millilitres, as follows:

$$\text{Tap density, g/cm}^3 = 50 \text{ g}/V$$


7. Precision and Bias

7.1 Precision has been determined from round-robin testing performed prior to the approval of this test method. Those results which have been re-verified show a precision of from ± 1 to 2 % of the value determined as the 2σ limits. The variation depends upon the tap density of the powder being determined which can vary between 2.0 and 8.0 g/cm³.

7.2 Bias cannot be stated since there is no universally accepted standard instrument, nor are instruments sold as certified standards.

8. Keywords

8.1 molybdenum; packed density; powder(s); refractory metals; rhenium; tantalum; tap density; Tap-Pak Volumeter; tungsten; tungsten carbide

 B 527.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, PA 19103.

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย



Designation: C 373 - 88

Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products¹

This standard is issued under the fixed designation C 373; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers procedures for determining water absorption, bulk density, apparent porosity, and apparent specific gravity of fired unglazed whiteware products.

1.2 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Significance and Use

2.1 Measurement of density, porosity, and specific gravity is a tool for determining the degree of maturation of a ceramic body, or for determining structural properties that may be required for a given application.

3. Apparatus and Materials

3.1 *Balance*, of adequate capacity, suitable to weigh accurately to 0.01 g.

3.2 *Oven*, capable of maintaining a temperature of 150 \pm 5°C (302 \pm 9°F).

3.3 *Wire Loop, Halter, or Basket*, capable of supporting specimens under water for making suspended mass measurements.

3.4 *Container*—A glass beaker or similar container of such size and shape that the sample, when suspended from the balance by the wire loop, specified in 3.3, is completely immersed in water with the sample and the wire loop being completely free of contact with any part of the container.

3.5 *Pan*, in which the specimens may be boiled.

3.6 *Distilled Water*.

4. Test Specimens

4.1 At least five representative test specimens shall be selected. The specimens shall be unglazed and shall have as much of the surface freshly fractured as is practical. Sharp edges or corners shall be removed. The specimens shall contain no cracks. The individual test specimens shall weigh at least 50 g.

5. Procedure

5.1 Dry the test specimens to constant mass (Note) by

heating in an oven at 150°C (302°F), followed by cooling in a desiccator. Determine the dry mass, D , to the nearest 0.01 g.

NOTE—The drying of the specimens to constant mass and the determination of their masses may be done either before or after the specimens have been impregnated with water. Usually the dry mass is determined before impregnation. However, if the specimens are friable or evidence indicates that particles have broken loose during the impregnation, the specimens shall be dried and weighed after the suspended mass and the saturated mass have been determined, in accordance with 5.3 and 5.4. In this case, the second dry mass shall be used in all appropriate calculations.

5.2 Place the specimens in a pan of distilled water and boil for 5 h, taking care that the specimens are covered with water at all times. Use setter pins or some similar device to separate the specimens from the bottom and sides of the pan and from each other. After the 5-h boil, allow the specimens to soak for an additional 24 h.

5.3 After impregnation of the test specimens, determine to the nearest 0.01 g the mass, S , of each specimen while suspended in water. Perform the weighing by placing the specimen in a wire loop, halter, or basket that is suspended from one arm of the balance. Before actually weighing, counterbalance the scale with the loop, halter, or basket in place and immerse in water to the same depth as is used when the specimens are in place. If it is desired to determine only the percentage of water absorption, omit the suspended mass operation.

5.4 After the determination of the suspended mass or after impregnation, if the suspended mass is not determined, blot each specimen lightly with a moistened, lint-free linen or cotton cloth to remove all excess water from the surface, and determine the saturated mass, M , to the nearest 0.01 g. Perform the blotting operation by rolling the specimen lightly on the wet cloth, which shall previously have been saturated with water and then pressed only enough to remove such water as will drip from the cloth. Excessive blotting will introduce error by withdrawing water from the pores of the specimen. Make the weighing immediately after blotting, the whole operation being completed as quickly as possible to minimize errors due to evaporation of water from the specimen.

6. Calculation


6.1 In the following calculations, the assumption is made that 1 cm³ of water weighs 1 g. This is true within about 3 parts in 1000 for water at room temperature.

6.1.1 Calculate the exterior volume, V , in cubic centimetres, as follows:

$$V = M - S$$

¹ This test method is under the jurisdiction of ASTM Committee C-21 on Ceramic Whitewares and Related Products and is the direct responsibility of Subcommittee C21.03 on Fundamental Properties.

Current edition approved Sept. 30, 1988. Published November 1988. Originally published as C 373 - 53 T. Last previous edition C 373 - 72 (1982).

 C 373

6.1.2 Calculate the volumes of open pores V_{OP} and impervious portions V_{IP} in cubic centimetres as follows:

$$V_{OP} = M - D$$

$$V_{IP} = D - S$$

6.1.3 The apparent porosity, P , expresses, as a percent, the relationship of the volume of the open pores of the specimen to its exterior volume. Calculate the apparent porosity as follows:

$$P = [(M - D)/V] \times 100$$

6.1.4 The water absorption, A , expresses as a percent, the relationship of the mass of water absorbed to the mass of the dry specimen. Calculate the water absorption as follows:

$$A = [(M - D)/D] \times 100$$

6.1.5 Calculate the apparent specific gravity, T , of that portion of the test specimen that is impervious to water, as follows:

$$T = D/(D - S)$$

6.1.6 The bulk density, B , in grams per cubic centimetre, of a specimen is the quotient of its dry mass divided by the exterior volume, including pores. Calculate the bulk density as follows:

$$B = D/V$$

7. Report

7.1 For each property, report the average of the values obtained with at least five specimens, and also the individual values. Where there are pronounced differences among the individual values, test another lot of five specimens and, in addition to individual values, report the average of all ten determinations.

8. Precision and Bias

8.1 This test method is accurate to $\pm 0.2\%$ water absorption in interlaboratory testing when the average value recorded by all laboratories is assumed to be the true water absorption. The precision is approximately $\pm 0.1\%$ water absorption on measurements made by a single experienced operator.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, PA 19103.

จุฬาลงกรณ์มหาวิทยาลัย

ไฟล์หมายเลข (File No.) ของสารเคมี

17-464

d	2.53	2.96	1.48	4.84	MgFe ₂ O ₄ (low temperature) Magnesium Iron Oxide (Magnesioferrite, low)					
l/l ₁	100	40	35	4						
Rad. CuKα λ 1.542 Filter Ni Dia. Diffractionmeter					d Å	l/l ₁	hkl	d Å	l/l ₁	hkl
Cut off 1/l ₁ Diffractometer					4.34	4	111	0.221	4	862
Ref. W.C. Allen, School of Ceramics, Rutgers Univ., New Brunswick, N.J. (1965)					2.96	40	220	.810	8	951,773
S.G. Cubic S.G. Fd3m (227)					2.525	100	311			
a 8.375 b c A C					2.418	2	222			
Ref. Ibid. Y Z 8 Dx 4.522					2.094	25	400			
ca n=β 2.35 (calc) γ Sign					1.709	14	422			
2V D mp Color Red to brown					1.612	30	511,333			
Ref. Ibid.					1.481	35	440			
					1.324	6	620			
					1.277	8	533			
					1.208	2	444			
					1.119	4	642			
					1.090	12	731,353			
					1.047	6	800			
					0.987	4	822,660			
Synthetic, by solid state reaction of MgO, Fe ₂ O ₃ in air at 1600°C equilibrated at temp. below 350°C and quenched. Spinel structure 181 normal.					.967	8	751,555			
Magnesioferrites equilibrated at temperatures between 350 and 950 and quenched have cell sizes which range linearly between this form and the high temp. form.					.936	2	840			
					.893	4	664			
					.878	6	931			
					.855	10	844			

22-1012

d	2.54	2.98	1.49	4.87	ZnFe ₂ O ₄ Zinc Iron Oxide (Franklinite)					
l/l ₁	100	35	35	7						
Rad. CuKα λ 1.54056 Filter Mono. Dia. Diffractometer					d Å	l/l ₁	hkl	d Å	l/l ₁	hkl
Cut off 1/l ₁ Diffractometer 1/l ₁ cor. -3.8					4.87	7	111	.9684	2	662
Ref. National Bureau of Standards, Mono. 25, Sec. 9 (1971)					2.984	35	220	.9429	2	840
					2.543	100	311	.8999	1	664
S.G. Cubic S.G. Fd3m (227)					2.436	6	222	.8848	5	931
a 8.4411 b c A C					2.109	17	400	.8616	8	844
Ref. Ibid. β γ Z 8 Dx 5.324					1.937	1	331	.8277	4	1020
					1.723	12	422	.8159	6	951
					1.624	30	511	.8122	2	1022
					1.491	35	440			
ca n=β >2.00 γ Sign					1.4270	1	531			
2V D mp Color					1.3348	4	620			
Ref. Ibid.					1.2872	9	533			
					1.2721	4	622			
					1.2184	2	444			
					1.1820	1	711			
					1.1280	5	642			
					1.0990	11	731			
					1.0553	4	800			
					0.9949	2	822			
					.9747	6	751			
Pattern at 25°C. The sample was prepared by co-precipitation of the hydroxides, followed by heating at 600°C for 17 hours and one hour at 800°C. Spinel type.										

7-239 MINOR CORRECTION

d	2.37	4.77	1.79	4.77	U: (OH) ₂	★
I/I ₀	100	90	55	90		
MAGNESIUM HYDROXIDE (BRUCITE)						
Rad. CuK _α	λ 1.5405	Filter Ni	Dis.	d Å	I/I ₀	hkl
Cut off	1/1, Diffraction			4.77	90	001
Ref.	NBS CIRCULAR 522, VOLUME 6 (1956)			2.725	6	100
Sys. Hexagonal (Trigonal) S.G. D _{3d} - P6 ₃ (164)				2.365	100	101
a	3.147	b	c 4.769	1.794	55	102
β		γ	Z	1.573	35	110
Ref.	ibid.		Dx 2.37	1.434	14	111
				1.373	16	103
				1.363	2	200
				1.310	12	201
				1.192	2	004
				1.183	10	202
				1.118	2	113
				1.092	4	104
				1.034	6	203
				1.030	2	410
				1.0057	8	211
				0.9543	2	005
				.9503	6	114
				.9455	8	212
				.9085	4	100

141-561 n=2 1.581 1γ Sign +
1V D 2.39 mp Color COLORLESS
Ref. IBID. DANA'S SYSTEM OF MINERALOGY 7TH Ed. Vol 1

SAMPLE PREPARED AT NBS FROM U₂O AND WATER HELD AT 507°C AND 20,000 PSI FOR 3 DAYS; SPECT. ANALYSIS SHOWS: O.1% Ca < 0.01% As, Al, S, Fe, Si, Sn, Ti; < 0.01% O₂, Cu, Cu. Col₂ STRUCTURE TYPE. PATTERN MADE AT 26°C.

CALCULATED PATTERN-PEAK HEIGHT

See 24-72A

2.20	2.52	1.70	100	70	56	d Å	I/I ₀	hkl	d Å	I/I ₀	hkl
Fe ₂ O ₃						1.4543	21	300			
Iron Oxide						1.3514	2	208			
Hematite						1.3133	7	1010			
Ref. Smith et al., Annual Report to the Joint Committee on Powder Diffraction Standards (1973)						1.3078	4	119			
						1.2595	4	220			
Sys. Hexagonal S.G. R3c (167) Dx 5.255 Z 6						1.2285	2	306, 036			
a 5.938 b c 13.722						1.1908	3	128, 312			
Ref. Blake et al., Am. Min., 51 123 (1966)						1.1645	3	0210			
Scale factor (Integrated Intensities)						1.1416	4	134			
1 1.54050						1.1042	4	226			
d Å	I/I ₀	hkl	d Å	I/I ₀	hkl	1.0571	4	2110			
3.686	33	012	2.080	2	202	0.9611	3	224			
2.703	100	104	1.8428	31	024	.9596	5	0112			
2.519	70	110	1.6966	36	116	.9521	2	410			
2.295	2	006	1.6013	8	018, 122	.9090	2	1310			
2.208	17	113	1.4873	22	214	.8794	2	415, 146			
						.8448	2	121, 054			

16-154

d	2.49	2.77	1.54	4.94	Mn ₂ O ₃	★
I/I ₀	100	90	80	30		
Manganese Oxide						
Hausmannite						
Rad. FeK _α	λ 1.9373	Filter Mn	Dis. 57.3m	d Å	I/I ₀	hkl
Cut off	1/1, Visual			4.94	30	011
Ref.	E.W. Huffield, in Berry & Thompson, Geol. Soc. Amer. Mem. 35 125 (1962)			3.09	50	112
Sys. Tetragonal S.G. I41/amd (141)				2.39	30	070
a	5.76	b	c 7.44	2.77	90	013
β		γ	Z 1 Dx 1.84	2.49	100	121
Ref.	Aminoff, Z. Krist., 61 175 (1926) - Lingben.			2.36	40	004
				2.04	40	220
				1.825	20	024
				1.795	50	015
				1.706	30	132
				1.642	20	033
				1.570	50	231
				1.544	40	224
				1.468	10	116
				1.445	40	134, 040
				1.423	5	233
				1.387	5	141, 026
				1.350	30	035
				1.306	10	332
				1.292	10	240

1: 2.15 (Li) a=2 2.46 (Li) 1γ Sign -
2V D 4.24 mp Color brownish black
Ref. Dana's System of Mineralogy, 7th Edition

Sample from Linde, Thuringia, Germany. Same pattern given by mineral from Lingben, Sweden and Hfield, U.S. (Rundohr, Symp. on Manganese Tom I, Int. Geol. Congress Mexico, 1954)

5-0664 MAJOR CORRECTION

d	2.48	2.92	2.60	2.816	ZnO						
I/I ₁	100	71	56	71	Zinc Oxide	(Zincite)					
Rad. CuK _α	λ 1.5405	Filter Ni				d Å	I/I ₁	hkl	d Å	I/I ₁	hkl
Dia. Cut off	Coll.	d corr. sb.?				2.916	71	100	0.9069	12	213
I/I ₁ G. C. DIFFRACTOMETER						2.602	56	002	.8826	6	302
Ref. SWANSON AND FUYAT, NBS CIRCULAR 539, Vol. 2						2.476	100	101	.8675	1	006
						1.911	29	102	.8369	6	205
						1.626	40	110	.8290	2	106
Sys. Hexagonal	S.G. C _{6v} - P6 ₃ mc					1.477	35	103	.8237	2	314
a ₁ 3.249 b ₁	c ₁ 5.205 A	C 1.60				1.407	6	200	.8125	5	220
Ref. Ibid.	γ	Z 2				1.379	28	112			
						1.359	14	201			
						1.301	3	004			
ε d	n _D β	γ	Sign				1.238	5	202		
27 D ₂ 3.680 mp	Color										
Ref. Ibid.											
						1.1812	3	104			
						1.0929	10	203			
						1.0639	4	210			
						1.0422	10	211			
						1.0158	5	114			
						0.9848	4	212			
						.9764	7	105			
						.9555	1	204			
						.9382	4	300			
SAMPLE FROM NEW JERSEY ZINC CO. SPECT. ANALYSIS SHOWS <0.001% EACH OF Mg, Si AND Ca. X-RAY PATTERN AT 26°C.											
TO REPLACE 1-1136, 3-0752, 1-0888, 3-0891.											

4-0777 MAJOR CORRECTION

d	2.41	1.70	2.78	2.778	CaO						
I/I ₁	100	45	34	34	Calcium Oxide	(Lime)					
Rad. CuK _α	λ 1.5405	Filter Ni				d Å	I/I ₁	hkl	d Å	I/I ₁	hkl
Dia. Cut off	Coll.	d corr. sb.?				2.778	34	111			
I/I ₁ G. C. DIFFRACTOMETER						2.405	100	200			
Ref. SWANSON AND TATGE, JC FEL. REPORTS, NBS (1950)						1.701	45	220			
						1.451	10	311			
						1.390	5	222			
Sys. Cubic	S.G. O _h - Fm $\bar{3}$ m					1.203	4	400			
a ₁ 4.3105 b ₁	c ₁ A	Z 4				1.1036	4	331			
Ref. Ibid.	γ					1.0755	9	420			
						0.9819	9	422			
						.9258	3	511			
ε d	n _D = 1.33717	γ	Sign				.8504	4	440		
27 D ₂ 3.345 mp (NA)	Color										
Ref. (135)											
						.8131	5	531			
						.8018	6	600			
NBS ANALYSIS SHOWS ABOUT 0.31% CaO, 0.1% SiO ₂ , AND NO OTHER IMPURITY OVER 0.04% AT 27°C											
TO REPLACE 1-1160, 2-1089, 3-1123											

5-0490 MINOR CORRECTION

d	3.34	4.26	1.82	4.26	SiO ₂						
I/I ₁	100	35	17	35	SILICON OXIDE	QUARTZ LOW					
Rad. CuK _α	λ 1.5405	Filter Ni				d Å	I/I ₁	hkl	d Å	I/I ₁	hkl
Dia. Cut off	Coll.	d corr. sb.?				4.26	35	100	1.228	2	250
I/I ₁ G. C. DIFFRACTOMETER						3.343	100	101	1.1997	2	213
Ref. SWANSON AND FUYAT, NBS CIRCULAR 539, Vol. 2						2.456	12	110	1.1973	2	221
						2.282	12	102	1.1838	4	114
						2.237	6	111	1.1802	4	110
Sys. Hexagonal	S.G. D _{3h} - P3 ₁ 21					2.128	9	200	1.1530	2	311
a ₁ 4.913 b ₁	c ₁ 5.405 A	C 1.10				1.980	6	201	1.1408	<1	204
Ref. Ibid.	γ	Z 3				1.817	17	112	1.1144	<1	303
						1.801	<1	003	1.0916	4	312
						1.672	7	202	1.0636	1	400
ε d	n _D = 1.5442	γ 1.553	Sign				1.659	3	103	1.0477	2
27 D ₂ 2.647 mp	Color										
Ref. Ibid.											
						1.608	<1	210	1.0437	2	401
						1.541	15	211	1.0346	2	314
						1.453	3	113	1.0149	2	223
						1.418	<1	300	0.9896	2	402, 115
						1.382	7	212	.9872	2	313
						1.375	11	203	.9781	<1	104
						1.372	9	301	.9762	1	120
						1.288	3	104	.9607	2	321
						1.256	4	202	.9285	<1	410
SAMPLE FROM LAKE TOXAWAY, N.C. SPECT. ANAL. <0.05% AL; <0.001% Ca, Cu, Fe, Mn. X-RAY PATTERN AT 25°C.											
REPLACES 1-0649, 2-0458, 2-0459, 3-0427, 3-0444, 3-0471, 3-0419.											

ประวัติผู้เขียน

นายมนตรี บุญสิทธิ์ เกิดวันที่ 27 ธันวาคม พ.ศ.2501 ที่ อ.รัตนบุรี จ.นครศรี
 ธรรมราช สำเร็จการศึกษาระดับปริญญาตรีครุศาสตร์อุตสาหกรรมบัณฑิต สาขาวิศวกรรม
 อุตสาหกรรม คณะวิศวกรรมเทคโนโลยี สถาบันเทคโนโลยีราชมงคล ในปีการศึกษา 2525
 ต่อมาสำเร็จการศึกษาระดับ ประกาศนียบัตรบัณฑิต สาขาวิศวกรรมโลหการ คณะวิศวกรรม
 ศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ในปีการศึกษา 2530 และเข้าศึกษาต่อในหลักสูตร สาขา
 วัสดุศาสตร์ คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย เมื่อ พ.ศ.2533 ภาควิชา ปัจจุบัน
 รับราชการที่สถาบันเทคโนโลยีราชมงคล วิทยาเขตนนทบุรี อำเภอเมือง จ.นนทบุรี



ศูนย์วิทยทรัพยากร
 จุฬาลงกรณ์มหาวิทยาลัย