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Glass and Glass Products

Publications by Members of the Staff of the National Bureau of Standards, together with a list of Federal Specifications and Standard Samples.

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General Information

Some of the publications in this list have appeared in the regular series of publications of the Bureau and others in various scientific and technical journals.

Where the price is stated, the publication can be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D.C. The prices quoted are for delivery to addresses in the United States and its territories and possessions and in certain countries which extend the franking privilege. In the case of all other countries, one-third the cost of the publication should be added to cover postage. Remittances should be made either by coupons (obtainable from the Superintendent of Documents in sets of 20 for \$1.00 and good until used), or by check or money order payable to the "Superintendent of Documents, Government Printing Office" and sent to him with order.

Publications marked "CP" are out of print, but, in general, may be consulted at technical libraries; those marked "MO" are mimeographed, no printed copies being available.

For papers in other scientific or technical journals, the name of the journal or of the organization publishing the article is given in abbreviated form with the volume number (underscored), page, and year of publication, in the order named.

Serial letters are used to designate the several series of Bureau publications:

- S - "Scientific Paper." S 1 to S 329 are "Reprints" from the "Bulletin of the Bureau of Standards." S 330 to S 572 were published as "Scientific Papers of the Bureau of Standards." This series was superseded by the "Bureau of Standards Journal of Research" in 1928.
- T - "Technologic Paper." T 1 to T 370. This series was superseded by the "Bureau of Standards Journal of Research" in 1928.
- RP - "Research Paper." These are reprints of articles appearing in the "Bureau of Standards Journal of Research" and the "Journal of Research of the National Bureau of Standards," the latter being the title of this periodical since July 1934 (volume 13, number 1).
- C - "Circular."
- CS - "Commercial Standard."
- R - "Simplified Practice Recommendation."
- FS - "Federal Specification."

Circular 24 and supplements, the complete list of the Bureau's publications (1901-1945), is sold by the Superintendent of Documents for \$1.30. Announcement of new publications is made each month in the Technical News Bulletin, which is obtainable by subscription at 50 cents a year.

Part I - Scientific Papers

	<u>Series</u>	<u>Price</u>
Optical conditions accompanying the striae which appear as imperfections in optical glass, A.A.Michelson, S, <u>15</u> , 41, 1919.	S 333	OP
Concerning the annealing and characteristics of glass, A.Q.Tool and J. Valasek.S, <u>15</u> 537, 1919.	S 358	OP
Characteristics of striae in optical glass, T.T.Smith, A.H.Bennett and G.E.Merritt. S, <u>16</u> , 75, 1920.	SS373	OP
Measurements on the thermal dilation of glass at high temperatures, C.G.Peters and C.H. Cragoe. S, <u>16</u> , 449, 1920.	SS393	OP
Cause and removal of certain heterogeneities in glass, L.W.Tilton, A.H.Finn and A.Q.Tool. S, <u>22</u> , 719, 1928.	S 572	OP

Part II - Technologic Papers

Glasses for protecting the eyes from injurious radiations, W.W. Coblentz and W.B. Emerson. T, 3d Ed., 1919.	T 93	OP
Comparative tests of chemical glassware, P.H. Walker and F.W. Smither. T, <u>10</u> , 1917-18.	T 107	OP
Transmissive properties of eye protective glass and other substances, W.W. Coblentz and R. Stair. T, <u>22</u> , 555, 1928.	T 369	OP

Part III - Research Papers

Determination of the source and the means of prevention of stones in glass, F. Insley. BSJR, <u>2</u> , 1077, 1929.	RP 71	5¢
Making the glass disk for a 70-inch telescope reflector, A.H. Finn. BSJR, <u>3</u> , 315, 1929.	RP 97	OP
Determination of fluorine and of silica in glasses and enamels containing fluorine, J.I. Hoffman and G.E.F.Lundell. BSJR, <u>3</u> , 581, 1929.	RP 110	5¢

	<u>Series</u>	<u>Price</u>
On a modified method for decomposing aluminous silicates for chemical analysis, A.N. Finn and J.F. Klekotka. BSJR, <u>4</u> , 309, 1930.	RP 180	OP
Dimensional changes caused in glass by heating cycles, A.Q. Tool, D.B. Lloyd and G.E. Merritt. BSJR, <u>5</u> , 627, 1930.	RP 219	10¢
Determination of magnesium in portland cement and similar materials by the use of 8-Hydroxyquinoline, J.C. Redmond and H.A. Bright, BSJR, <u>6</u> , 113, 1931.	RP 265	OP
Variations caused in the heating curves of glass by heat treatment, A.Q. Tool and C.G. Eichlin. BSJR, <u>6</u> , 523, 1931.	RP 292	OP
The index of refraction of some soda-lime-silica glasses as a function of the composition, C.A. Faick and A.N. Finn. BSJR, <u>6</u> , 993, 1931.	RP 320	OP
The restoration of solarized ultraviolet transmitting glasses by heat treatment, A.Q. Tool and R. Stair. BSJR, <u>7</u> , 357, 1931.	RP 345	10¢
The density of some soda-lime-silica glasses as a function of the composition, F.W. Glaze, J.C. Young and A.N. Finn. BSJR, <u>9</u> , 799, 1932.	RP 507	OP
The viscosity of optical glass, W.H. Wadleigh. BSJR, <u>11</u> , 65, 1933.	RP 577	OP
Effect of heat treatment on the expansivity of a Pyrex glass, J.B. Saunders and A.Q. Tool. BSJR, <u>11</u> , 799, 1933.	RP 626	OP
Thermal expansion of some soda-lime-silica glasses as functions of the composition, B.C. Schmid, A.N. Finn and J.C. Young. BSJR, <u>12</u> , 421, 1934.	RP 667	OP
Index of refraction, density, and thermal expansion of some soda-alumina-silica glasses as functions of the composition, C.A. Faick, J.C. Young, D. Hubbard and A.N. Finn. JRNS, <u>14</u> , 133, 1935.	RP 762	OP
The routine determination of boron in glass, F.W. Glaze and A.N. Finn. JRNS, <u>16</u> , 421, 1936.	RP 882	OP

	Series	Price
<u>Part III - Research Papers</u>		
Gases in some optical and other glasses, Clarence Hahner, George Q. Voigt and Alfred N. Finn. JRNBS, <u>19</u> , 95, 1937.	RP 1014	5¢
Observations on crystalline silica in certain devitrified glasses, A.Q. Tool and H. Insley. JRNBS, <u>21</u> , 743, 1938.	RP 1152	5¢
Effect of the solubility of glass on the behavior of the glass electrode, Donald Hubbard, Edgar H. Hamilton and Alfred N. Finn. JRNBS, <u>22</u> , 339, 1938.	RP 1187	5¢
Density of some soda-potash-silica glasses as a function of the composition, John C. Young, Francis W. Glaze, Conrad A. Faick and Alfred N. Finn. JRNBS, <u>22</u> , 453, 1939.	RP 1197	5¢
Improved interferometric procedure with applications to expansion measurements, J.B. Saunders. JRNBS, <u>23</u> , 179, 1939.	RP 1227	10¢
Effect of composition and other factors on the specific refraction and dispersion of glasses, John C. Young and Alfred N. Finn. JRNBS, <u>25</u> , 759, 1940.	RP 1352	5¢
Comparative tests of chemical glassware, Edward Wichers, A.N. Finn and W. Stanley Clabaugh. JRNBS, <u>26</u> , 537, 1941.	RP 1394	OP
Effect of the chemical durability of glass on the asymmetry potential and reversibility of the glass electrode, Edgar H. Hamilton and Donald Hubbard. JRNBS, <u>27</u> , 27, 1941.	RP 1400	5¢
An improvement in the "partition method" for the determination of boron, Francis W. Glaze and Alfred N. Finn. JRNBS, <u>27</u> , 33, 1941.	RP 1401	5¢
Chemical durability of glass by the interferometer method, Donald Hubbard and Edgar H. Hamilton. JRNBS, <u>27</u> , 143, 1941.	RP 1409	5¢
Thermal expansion studies of boric oxide glass and of crystalline boric oxide, James J. Donoghue and Donald Hubbard. JRNBS, <u>27</u> , 371, 1941.	RP 1425	5¢

Part III - Research Papers

	<u>Series</u>	<u>Price</u>
Titration and conductivity measurements of aqueous extracts from bottles, Edgar H. Hamilton and Donald Hubbard. JRNBS, <u>27</u> , 381, 1941.	RP 1426	5¢
A precision apparatus for the rapid determination of indices of refraction and dispersion by immersion, Conrad A. Faick and Bernhard Fonoroff. JRNBS, <u>32</u> , 67, 1944.	RP 1575	5¢
Relaxation of stresses in annealing glass, Arthur Q. Tool. JRNBS, <u>34</u> , 199, 1945.	RP 1637	5¢
Refractive-index standards of fluorocrown glass, Leroy W. Tilton. JRNBS, <u>34</u> , 599, 1945.	RP 1659	5¢
An apparatus for photographing interference phenomena, James E. Saunders. JRNBS, <u>35</u> , 157, 1945.	RP 1668	10¢
Specification of railroad signal colors and glasses, Eason S. Gibson, Geraldine Walker Haupt and Harry J. Keegan. JRNBS, <u>36</u> , 1, 1946.	RP 1688	10¢
Attack on refractory clay pots by optical glasses, Willard H. Parsons and Herbert Insley. JRNBS, <u>36</u> , 31, 1946.	RP 1689	10¢
Hygroscopicity of optical glasses as an indicator of serviceability, Donald Hubbard. JRNBS, <u>36</u> , 365, 1946.	RP 1706	5¢
Hygroscopicity and electrode function (pH response) of glasses as a measure of serviceability, Donald Hubbard. JRNBS, <u>36</u> , 511, 1946.	RP 1719	5¢
Viscosity and the extraordinary heat effects in glass, Arthur Q. Tool. JRNBS, <u>37</u> , 73, 1946.	RP 1730	10¢
Electrode function (pH response) of potash-silica glasses, Donald Hubbard. JRNBS, <u>37</u> , 223, 1946.	RP 1743	10¢

Part IV - Circulars

Spectral-transmissive properties and use of colored eye-protective glass, W.W. Coblentz and R. Stair. C, 1938.	C 421	OP
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Part V - Commercial Standards

	<u>Series</u>	<u>Price</u>
Interchangeable ground-glass joints, stopcocks and stoppers (fourth edition).	CS21-39	OP
Mirrors (second edition)	CS27-36	OP
Ground and polished lenses for sunglasses (second edition)	CS78-40	MO
Blown, Drawn, and dropped lenses for sunglasses (second edition)	CS79-40	MO

Part VI - Simplified Practice Recommendations

Milk and cream bottles and bottle caps.	R10	OP
Glass containers for preserves, jellies and apple butter.	R91-32	OP
Glass containers for mayonnaise and kindred products	R131-35	5¢
Glass containers for cottage cheese and sour cream	R148-33	5¢
Glass containers for green olives	R196-42	5¢
Glass containers for maraschino cherries.	R197-42	5¢

Part VII - Federal Specifications

Bottles; dropping - - - - -	DD-B-576	5¢
Bottles; prescription - - - - -	DD-B-591a	5¢
Chimneys and globes (lamp and lantern); glass	DD-C-311	5¢
Cups; pin and sponge - - - - -	DD-C-791	5¢
Dishes; culture and petri - - - - -	DD-D-411	5¢
Droppers; medicine - - - - -	DD-D-691	5¢
Funnels, glass; fluted or ribbed - - - - -	DD-F-796	5¢
Funnels, glass; smooth (chemical) - - - - -	DD-F-806	5¢

Part VII - Federal Specifications

	<u>Series</u>	<u>Price</u>
Glasses, cover; (for) microscopy - - - - -	DD-G-426	5¢
Glass; flat (for) glazing purposes - - - - -	DD-G-451	5¢
Glass; flat, glazing (for) transmitting not less than 25% of ultraviolet radiation at wave length 302 millimicrons - - - - -	DD-G-476	5¢
Glasses, gage; flat (plain and reflex), (for pressures 125 pounds and over) - - - -	DD-G-491	5¢
Glasses, gage; reflex and round, tank (for pressures under 125 pounds) - - - - -	DD-G-496	5¢
Glasses, gage; round, boiler (for pressures 125 pounds and over) - - - - -	DD-G-511	5¢
Glasses; medicine - - - - -	DD-G-616	5¢
Graduates; glass, conical - - - - -	DD-G-666	5¢
Inkstands, automatic and plain; and desk-sets	DD-I-546	5¢
Pipettes, Ostwald - - - - -	DD-P-386	5¢
Tableware; glass - - - - -	DD-T-101a	5¢
Urinals; male, glass, graduated - - - - -	DD-U-686a	5¢
Volumetric-apparatus; glass - - - - -	DD-V-581	5¢
Watch-glasses - - - - -	DD-W-131	5¢
Hydrometers; antifreeze solutions - - - - -	GG-H-916	5¢
Hydrometers; syringe (for lead-acid storage batteries) - - - - -	GG-H-941	5¢
Slides, glass; (for) microscopy - - - - -	GG-S-446	5¢
Spectacles; protective, ultraviolet - - - -	GG-S-606	5¢
Insulation (glass-fiber); semirigid - - - -	HH-I-556	5¢
Goggles, eyecup; impact-resisting (chippers', grinders', etc.) - - - - -	GGG-G-501a	5¢
Goggles; protective (glare and welders') - -	GGG-G-511	10¢
Goggles; rubber-frame - - - - -	GGG-G-521	5¢

Part VIII - Outside Publications

J. - Journal of the American Ceramic Society, 2525 North High Street, Columbus 2, Ohio.

Variation in soda, lime, and magnesia content of a glass of the type RO_3SiO_2 , C.C. Rand. Transactions, American Ceramic Society, 17, 236 1915.

Comparative tests of chemical glassware, P.H. Walker and F.W. Smither. J. Ind. & Eng. Chem., 9, 1090, 1918 (Ind. & Eng. Chem., 1155 - 16th St. NW, Washington, D.C.).

Observations on the formation of seed in optical glass, A.E. Williams. J 1, 134, 1918.

Strength tests of plain and protective sheet glass, T.L. Sorey. J 1, 801, 1918.

Procedures in the manufacture of optical glass, W.S. Williams and C.C. Rand. J 2, 422, 1919.

Production of selenium red glass, F.A. Kirkpatrick and G.G. Roberts. J 2, 895, 1919.

Comparison tests for striae in optical glass, by the Brashear converging light, direct view method, the Bureau of Standards tank immersion method, and the short range projection method, L.E. Dodd, J 2, 977, 1919.

Annealing of glass. A symposium on pyrometry, held in 1919 by American Institute of Mining and Metallurgical Engineers, A.Q. Tool and J. Valasek. Special volume, 475, 1920. (29 West 39th Street, New York City).

The absorption of heat in glass, A.Q. Tool and G.G. Eichlin. Jour. Opt. Soc. of Am., 4, 340, 1920. (57 East 55th Street, New York 22, N.Y.).

Disintegration of soda-lime glasses in water. A.E. Williams. J 5, 504, 1922.

The weathering of glass containers, K.L. Ford. J 5, 837, 1922.

Tests on the resistive qualities of soda-lime glasses to water, L.A. Palmer. J 6, 579, 1923.

A study of the origin and cause of stones in glass, H. Insley. J 6, 706, 1923.

The mechanical strength of glazing glass, A.E. Williams. J 6, 980 1923.

Part VIII - Outside Publications

The microscopic identification of stones in glass, H. Insley. J. 7, 14, 1924.

Certain effects produced by chilling glass, A.Q. Tool and C.G. Eichlin. Jour. Opt. Soc. of Am., 8, 419, 1924. (57 East 55th Street, New York 22, N.Y.).

Some light transmissive characteristics of eyeglasses, W.W. Coblentz The Central J. of Homeopathy, 5, 597, 1924.

Variations in glass caused by heat treatment, A.Q. Tool and C.G. Eichlin. J 8, 1, 1925.

On the constitution and density of glass, A.Q. Tool and E.E. Hill. Jour. Soc. of Glass Tech., 9, 185, 1925 (Sheffield, England).

The density and index of refraction of glass versus its composition, A.N. Finn and H.G. Thomson. J 8, 505, 1925.

The failure of thermocouple protection tubes in glass melting furnaces, H. Insley. J 8, 605, 1925.

Regarding the heat treatment of glass and its refractivity and density, A.Q. Tool, L.W. Tilton and E.E. Hill. J. Opt. Soc. of Am. and Rev. Sci. Insts., 12, 490, 1926. (57 East 55th Street, New York 22, N.Y.).

A non-actinic cobalt blue glass, W.W. Coblentz and A.N. Finn. J 9, 423, 1926.

The annealing of glass - a non-technical presentation, A.N. Finn. J 9, 493, 1926.

Some observations of surface deposits formed in glass furnace regenerators, H. Insley. J 9, 635, 1926.

Tank control and devitrification, H. Insley. Glass Industry, 7, 1, 1926. (55 West 42d Street, New York 18, N.Y.).

The analysis of soda-lime glass, G.E.F. Lundell and H.B. Knowles. J 10, 829, 1927.

The determination of iron in glass sand, G.E.F. Lundell and H. B. Knowles. J 11, 119, 1928.

Some effects of carefully annealing optical glass, L.W. Tilton, A.N. Finn and A.Q. Tool. J 11, 292, 1928.

Part VIII - Outside Publications

The petrographic microscope as an instrument for the glass technologist, H. Insley. J 11, 812, 1928.

The effect of heat treatment on the physical properties of glass, A.Q. Tool and D.B. Lloyd. Fuels and Furnaces, 6, 353, 1928.

Determination of the source and the means of prevention of stones in glass, H. Insley. J 12, 143, 1929. Also RP 71.

Making the glass disk for a 70-inch telescope reflector, A.N. Finn. Ind. & Eng. Chem., 21, 744, 1929. (1155-16th Street NW, Washington, D.C.). Also RP 97.

On a modified method for decomposing aluminous silicates for Chemical analysis, A.N. Finn and J.F. Klekotka. Ceramic Age, 16, 158, 1930. (421 Parker Street, Newark, N.J.). Also RP 180.

Dimensional changes caused in glass by heating cycles, A.Q. Tool, D.B. Lloyd and G.E. Merritt. J 13, 632, 1930. Also RP 219.

Variations caused in the heating curves of glass by heat treatment, A. Q. Tool and C.G. Eichlin. J 14, 276, 1931. Also RP 292,

The index of refraction of some soda-lime-silica glasses as a function of the composition, C.A. Faick and A.N. Finn. J 14, 518, 1931. Also RP 320.

On the direct determination of soda in soda-lime glasses by precipitation as uranyl zinc sodium acetate, F.W. Glaze. J 14, 450, 1931.

The transmissive properties of tinted lenses, W.W. Coblentz. Am. J. of Ophthalmology, 15, 932, 1932. (837 Carew Tower, Cincinnati 2, Ohio).

Thermal expansion of some soda-lime-silica glasses as functions of the composition, B.C. Schmid, A.N. Finn and J.C. Young. Glass Industry, 15, 48, 1934 (55 West 42d Street, New York 18, N.Y.). Also RP 667.

Index of refraction, density, and thermal expansion of some soda-alumina-silica glasses as functions of the composition, C.A. Faick, J.C. Young, D. Hubbard and A.N. Finn. Glass Industry, 16, 81, 1935. (55 West 42d Street, New York 18, N.Y.). Also RP 762.

Defects produced by stones in glass, H. Insley. Glass Industry, 16, 79, 1935. (55 West 42d Street, New York 18, N.Y.).

Part VIII - Outside Publications

The routine determination of boron in glass, F.W. Glaze and A. N. Finn. Glass Industry, 17, 156, 1936. (55 West 42d Street, New York 18, N.Y.). Also RP 882.

Optical glass at the National Bureau of Standards, A.N. Finn. Jour. Opt. Soc. of Am., 28, 13, 1938. (57 East 55th Street, New York 22, N.Y.).

Potash in the glass industry, A.N. Finn. Ind. & Engl. Chem., 30, 891, 1938. (1155-16th Street NW, Washington, D.C.).

Relative solubility of glass in acid solutions as indicated by dye absorption, E.H. Hamilton and A. N. Finn. Glass Industry, 19, 179, 1938. (55 West 42d Street, New York 18, N.Y.).

An improved method for detecting case-hardened glass as a mirror component, J.J. Diamond. Glass Industry, 26, 372, 1945. (55 West 42d Street, New York 18, N.Y.).

The slip casting of clay pots for the manufacture of optical glass at the National Bureau of Standards, Raymond A. Heindl, Gordon B. Massengale and Louis G. Cossette, Glass Industry, 27, 177, 1946. (55 West 42d Street, New York 18, N.Y.).

Relation between inelastic deformability and thermal expansion of glass in its annealing range, Arthur Q. Tool. J 29, 240, 1946. Also RP 1730.

Part IX - Standard Samples

Standard samples of certain materials which are recommended for control work may be obtained from the National Bureau of Standards by prepayment of the indicated price. Such samples were prepared for checking the accuracy of methods of analysis, and those of particular interest to the ceramic industry are listed below. The Supplement to Circular C398, which can be obtained from this Bureau without charge, contains a complete list of our standard samples.

Standard Sample Number	Name	Constituents determined or intended use	Weight of sample in grams	Price
1a	Argillaceous limestone	Complete analysis	50	\$2.00
39f	Benzoic acid	Acidimetric and calorimetric values	30	2.00
40e	Sodium oxalate	Oxidimetric value	60	2.00
669	Bauxite	Complete analysis	60	2.00
70	Feldspar	" "	40	2.00
76	Burnt refractory (40% Al ₂ O ₃)	" "	60	2.00
77	Burnt refractory (60% Al ₂ O ₃)	" "	60	2.00
78	Burnt refractory (70% Al ₂ O ₃)	" "	60	2.00
79	Fluorspar	" "	60	2.50
80	Glass, soda-lime	" "	45	2.00
81	Glass sand	Fe ₂ O ₃ , Al ₂ O ₃ , TiO ₂ , ZrO ₂ , CaO, MgO	60	2.00
83a	Arsenious oxide	Oxidimetric value	75	2.00
84c	Acid potassium phthalate	Acidimetric value	60	3.00
88	Dolomite	Complete analysis	50	2.00
89	Glass, lead-barium	" "	60	2.00
91	Glass, opal	" "	45	2.00
92	Glass, low boron	B ₂ O ₃ only	60	2.00
93	Glass, high boron	Complete analysis	60	2.00
97	Flint clay	" "	60	2.00
98	Plastic clay	" "	60	2.00
99	Soda feldspar	" "	40	2.00
102	Silica brick	" "	60	2.00
103	Chrome refractory	" "	60	2.00
104	Burned magnesite	" "	60	2.00
112	Silicon carbide	" "	85	2.00
154	Titanium dioxide	TiO ₂ only	40	2.00

