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DEPARTMENT OF COMMERCE  
BUREAU OF STANDARDS  
WASHINGTON, D. C.

Letter  
Circular  
LC-392

October 13, 1933

PUBLICATIONS RELATING TO DYES

Bureau of Standards  
INTRODUCTION

This letter circular provides a list of all papers relating to dyes, written by or in collaboration with members of the staff of the Bureau of Standards, including those appearing in non-governmental as well as in governmental publications. The papers are listed chronologically according to the date of publication. Brief abstracts of the more important contributions are given.

In general, unless specifically stated in the list, the papers are not obtainable from the Bureau of Standards. Bureau publications for which a price is given may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D.C., at the price stated. Stamps are not accepted. Papers marked with an asterisk are out of print but are available in many libraries. The papers appearing in non-governmental publications may also be consulted in libraries.

Bureau publications are designated by a series letter or letters followed by a number. C is used to designate Circular; CSM, Commercial Standards Monthly; LC, Letter Circular; M, Miscellaneous Publication; RP, Research Paper; S, Scientific Paper; T, Technologic Paper; and TNB, Technical News Bulletin. These designations should be used when ordering from the Superintendent of Documents.



- | Ref. | Pub. | Year | Author                                                                                 | Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| 1    | M19  | 1918 | Dannerth, F.                                                                           | A plan for the evaluation of dyes. Proc. 2nd Ann. Textile Conference held at the Bur. Standards, Washington, May 21-22, 1917. pp. 63-66. 20 ¢                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 2    | M19  | 1918 | Dannerth, F.                                                                           | Plea for a standard nomenclature for organic dyes. Proc. 2nd Ann. Textile Conference, pp. 66-68. See ref. 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 3    | C41* | 1918 |                                                                                        | Testing and properties of textile materials. 3d ed. 15 pp. September 20, 1918. Outlines tests used at that time for evaluating fastness of color of dyed fabrics.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4    |      | 1920 | Burka, S.M.                                                                            | Hypersensitizing commercial panchromatic plates. J. Franklin Inst., vol. 189, pp. 25-46; January 1920. A study of the influence of ammonia in increasing the sensitizing effect of the dye in commercial panchromatic plates.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 5    |      | 1920 | Meyers, W.F.                                                                           | Dyes for photographic sensitizing. J. Optical Soc. Am., vol. 4, pp. 91-104; May 1920. Curves show the spectral absorption of solutions of 5 photographic sensitizing dyes (orthochrome T, pinaverdol, pinacyanol, dicyanine and kryptocyanine) and the corresponding spectral sensitivity of plates bathed in solutions of these dyes. Information is given on the technique of sensitization by bathing.                                                                                                                                                                                                                                                                      |
| 6    | C95* | 1920 |                                                                                        | Inks - their composition, manufacture and methods of testing. 1st ed. June 28, 1920. This circular gives general information on inks. It is superseded by C95 (2d ed.), Ref. No. 12. See also ref. 62.                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 7    | S422 | 1921 | Walters, F.M.<br>Davis, R.                                                             | Studies in color sensitive photographic plates and methods of sensitizing by bathing. 23 pp. November 15, 1921. 15 ¢ Detailed description of technique of sensitization by bathing, and of hypersensitization of commercial panchromatic materials.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 8    | S440 | 1922 | Gibson, K.S.<br>McNicholas, H.J.<br>Tyndall, E.P.<br>Frehafer, W.K.<br>Mathewson, W.E. | The spectral transmissive properties of dyes: I. Seven permitted food dyes, in the visible, ultra-violet, and near infra-red. 64 pp. May 15, 1922. 15 ¢ Quantitative data are presented on the spectral transmittancy of aqueous solutions of naphthol yellow S, orange I, ponceau 3R, amaranth, erythrosine, indigodisulphonic acid, and light green SF yellowish in the ultra-violet, visible, and near infra-red, from wave length 240 to 1360 millimicrons. The solutions were buffered to fix the H-ion concentration for all dyes except erythrosine for which distilled water was used. Four methods of measurement were used: (1) the visual method, using the Koenig- |

| Ref. | Pub. | Year | Author | Title                                                                                                                                                                                                                                                                                              |
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|      |      |      |        | Martens polarization spectrophotometer; (2) the photographic method, with the Hilger sector photometer and quartz spectrograph; (3) the photoelectric null method; and (4) the thermoelectric method. These methods are fully described and the apparatus illustrated by photographs and diagrams. |

- 9 T250\* 1924 Merritt, M. F. Pulp and paper fiber composition standards: Reference standards, showing the color reactions of common paper-making fibers and standard fiber mixtures with various stains for use in identification and estimation of fiber composition of papers. 5 pp. April 25, 1924.

In standardizing the micro-analysis of paper fibers, there are no colored charts or plates of 100 percent pure pulps or standard percentage mixtures of standard pulps. This publication covers eight fiber compositions and one plate of the color reactions produced by the stains. Standard pulps and pulp compositions used in the estimation of fiber content were selected for the micrographs, different stains being used to bring out various characteristics of the fibers. The four stains employed were Delafield's hematoxylin, malachite green, Herzberg stain and the Lofton-Merritt stains. A list of the water colors that matched the stained fibers is given.

- 10 1924 Appel, W.D. Spectrophotometric analysis applied to chromo-  
Brode, W.R. trope 10B. Ind. Eng. Chem., Vol. 16, pp. 797-799; August 1924.

The data presented indicate that spectrophotometric measurements of solutions of chromotrope 10B may be used to determine color strength and that such determinations agree very well with practical dyeing tests for strength. The measurements cannot be translated into dye-testing terms of hue ("shade") and brightness for smaller variations in the quality of the dye. Quantitative spectrophotometric measurements of reasonably pure chromotrope 10B ( $\alpha$ -naphthalene-azo-1, 8-dihydroxy-naphthalene-3, 6-disulphonic acid)  $\alpha$ -naphthalene-azo-1-amino-8-hydroxy-naphthalene-3, 6-disulphonic acid, and  $\alpha$ -naphthalene-azo-1-hydroxynaphthalene-3, 6, 8-trisulphonic acid are given.

- 11 1924 Appel, W.D. The elimination of variables in the dyeing method of testing dyes. Am. Dyestuff Repr., vol. 13, pp. 507-510; August 11, 1924.

The object of this work was to devise a laboratory method for dyeing which would eliminate the variables or make their control possible so that results might be duplicated at will. The variables include the fiber itself, initial and final temperature of dye bath, rate at which temperature is raised or lowered, uneven heating, the way in which the ingredients are added to the bath, the way in which the fiber is worked in the bath, rinsing, wringing, drying, and finally the conditions under which the dyeings are compared.



- | Ref. | Pub. | Year | Author        | Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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|      |      |      |               | It is proposed to dye loose fibers cut into very short lengths in a closed dye bath equipped with reflux condenser and agitation in the bath. The temperature is controlled by means of an outer jacket containing a liquid of constant boiling point. The method should make possible the duplication of results and lead to improved standard dyeing methods for testing the strength and quality of dyes. Dyeings prepared by the method are particularly suited for reflectance and transmittance measurements.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 12   | C95* | 1925 | (Welch, L.M.) | Inks; typewriter ribbons and carbon paper.<br>32 pp. 2nd. ed. March 5, 1925.<br>This circular contains a discussion of the composition and methods of testing inks, typewriter ribbons and carbon paper. It is superseded by LC 331 (ref.54). See also ref.6 and 62.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 13   |      | 1925 | Carroll, B.H. | Solarization, and photographic reversal by desensitizers. J. Phys. Chem., vol.29, pp. 693-704; June 1925.<br>Twenty-one dyes and a number of inorganic salts were studied spectrographically as to their tendency to cause reversed images in preexposed plates, on a second exposure. The long wave length limit of this process is found to be approximately the same as for plates sensitized with dicyanine. The evidence from this study strongly supports the oxidation theory of desensitization.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 14   |      | 1925 | Appel, W.D.   | A new lamp for fading tests. Am. Dyestuff Repr., vol. 14, pp. 882-883; December 28, 1925.<br>The radiation from a nitrogen filled tungsten lamp after passage through an aqueous solution of copper sulphate is used as an approximation to sunlight for accelerated tests for fastness to light of dyed fabrics.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 15   |      | 1926 | Brode, W.R.   | The effect of solvents on the absorption spectrum of a simple azo dye. J. Phys. Chem., vol.30, pp.56-69; January 1926.<br>The Hilger sector photometer with quartz spectrograph was used in the determination of the ultraviolet transmission to a frequency of 1360 vibrations per 10 <sup>-12</sup> second (wave length 220mμ) of some 30 organic solvents and of solutions of benzeneazophenol in them. From the data obtained it appears that for this simple azo dye, and in all probability for other simple azo dyes, Kundt's law does not hold. There appears to be no definite relation between the refractive indices or the dielectric constants of these solutions and the frequency of the absorption band of the dye dissolved in them. In mixtures the dye appears to give the absorption frequency for the most polar solvent, even if this solvent is present in very low percentage and there is a slight dilution effect in such cases. Absorption appears to be greater for polar solvents than for nonpolar solvents. |

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| 16   |         | 1926 | Carroll, B.H.                             | The photochemical oxidation of leuco-bases. J. Phys. Chem., vol. 30, pp.130-133; January 1926.<br>This study reports an attempt to secure improved sensitivity for the red and infrared. In the photographic process studied, the image is composed of a dye, formed by the photochemical oxidation of the leuco-base of the dye.                                                                                                                                                                                                                                                                          |
| 17   | TNB.108 | 1926 |                                           | Fastness of dye on tent duck. TNB No.108 p.3; April 1926.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 18   |         | 1926 | Appel, W.D.<br>Brode, W.R.<br>Welch, I.M. | Standardization of Agalma black 10B. Ind. Eng. Chem., vol. 18, pp.627-629; June 1926.<br>A series of samples of agalma black 10B from foreign and domestic manufacturers has been evaluated independently by means of titanous chloride titration, spectrophotometric measurements, and practical dyeings. The possibility of writing specifications and establishing one or more trade standards for the dye is discussed.                                                                                                                                                                                |
| 19   |         | 1926 | Brode, W.R.                               | Subsidiary dyes in commercial agalma black 10B. Ind. Eng. Chem., vol. 18, pp. 708-712; July 1926.<br>A spectrophotometric method has been developed for the quantitative determination of impurities in agalma black 10B. The spectral absorption in the visible is reported for agalma black 10B, acid fuchsin (1-amino-8-naphthol-7-azobenzene-3, 6-disulphonic acid), 2-p-nitrobenzeneazo-1-amino-8-naphthol-7-azo-p-nitrobenzene-3, 6-disulphonic acid, and for 2-p-nitrobenzeneazo-1-amino-8-naphthol-3, 6-disulphonic acid. Data relating to the mechanism and reactions of mixed dyeings are given. |
| 20   |         | 1926 | Brode, W.R.                               | The absorption spectra of benzeneazobenzene. J. Am. Chem. Soc., vol. 48, pp. 1984-1988; July 1926.<br>The absorption spectra of benzeneazobenzene in a number of solvents were determined. It is shown that there is no extensive shift of the band with a change of typical organic solvents, as was the case with benzeneazophenol. The absorption band of benzeneazobenzene is not simple but consists of a smaller band on the lower frequency side of the principal band which adds to the principal band to produce the observed absorption curve.                                                   |
| 21   |         | 1926 | Carroll, B.H.                             | Sensitization for the entire visible spectrum. J. Optical Soc. Am., vol. 13, pp.35-37; July 1926.<br>Bathing photographic plates with a very dilute mixture of pinacyanol and pinaflavol in a 1% pyridine solution confers a high and unusually uniform sensitivity for the entire visible spectrum. The plates were usable for at least a month after bathing.                                                                                                                                                                                                                                            |
| 22   |         | 1926 | Appel, W.D.                               | The work of the Bureau of Standards on dyes. Ind. Eng. Chem., vol. 18, pp.1341-1342; December 1926.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

| Ref. | Pub.    | Year | Author                     | Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| 23   |         | 1926 | Appel; W.D.                | Report of the Committee on Light Fastness. Further report on light fastness tests. Am. Dyestuff Reprtr., vol.15; pp.857-861; December 27, 1926.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|      |         |      |                            | A preliminary report is given of how the tests are being made, how the results are being studied, some general results which are subject to verification and revision as the study progresses, and some observations on peculiarities of behavior.                                                                                                                                                                                                                                                                                                                                   |
| 24   | TNB 117 | 1927 |                            | Removal of mercurochrome stains from clothing. TNB No.117, pp.7-8; January 1927.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 25   |         | 1927 | Cady, W.H.<br>Appel, W.D.  | Report of the Subcommittee on Light Fastness; 1. Light Exposures series 3, Am. Dyestuff Reprtr., vol. 16, pp. 707-715; November 14, 1927.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|      |         |      |                            | Twenty-nine identical sets of twenty selected dyeings were exposed to daylight under a variety of conditions, and in different localities at different times of the year, repeatedly to vidlet carbon arc light, and under controlled conditions of atmospheric humidity to incandescent lamp light. The exposures were timed so as to obtain the same average fading in each set. Records of the energies received by some of the samples were obtained with the aid of a barium photoelectric cell and automatic recorder. The conclusions to be drawn from the results are given. |
| 26   |         | 1927 | Appel, W.D.                | Report on experiments with the photoelectric cell in relation to testing fastness to light of dyed materials. Am. Dyestuff Reprtr., vol. 16, pp. 715-719; November 14, 1927.                                                                                                                                                                                                                                                                                                                                                                                                         |
|      |         |      |                            | The tests reported indicate that the amount of fading of dyed textiles under variable conditions of daylight exposure is not adequately measured by the incident energy recorded by the barium photoelectric cell.                                                                                                                                                                                                                                                                                                                                                                   |
| 27   |         | 1928 | Appel, W.D.                | A method for measuring the color of textiles. Am. Dyestuff Reprtr., vol.17, pp.49-54; January 23, 1928.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|      |         |      |                            | A simple and relatively inexpensive method for measuring the reflection of colored fabrics and other surfaces at a few wave lengths in the visible spectrum is described.                                                                                                                                                                                                                                                                                                                                                                                                            |
| 28   |         | 1928 | Appel, W.D.<br>Smith, W.C. | Report of the Subcommittee on Light Fastness: 2. The fading of dyed textiles in the light transmitted by various glasses. Am. Dyestuff Reprtr., vol. 17, pp.410-422; June 25, 1928.                                                                                                                                                                                                                                                                                                                                                                                                  |
|      |         |      |                            | Twenty selected dyeings were exposed to sunlight without glass cover and under window glass, Corex, Vita and six other special glasses of known transmission. The fading is recorded in the form of quantitative reflection measurements. The spectral distribution of the radiation and the extent to which the fading of the dyeings is affected by changes in distribution and intensity produced by passage through the glasses are reported.                                                                                                                                    |



- | Ref.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Pub. | Year | Author                                           | Title                                                                                                                                                                                                              |
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| 29                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | RP6  | 1928 | Coblentz, W.W.<br>Stair, R.<br>Schoffstall, C.W. | Some measurements of the transmission of ultra-violet radiation through various fabrics. B.S. Jour. Research, vol. 1, pp.105-124; August 1928.<br>5¢                                                               |
| <p>In all cases when the fabric is dyed, or slightly yellowed with age, the ultra-violet transmission through the thread is greatly decreased. Hence, as is to be expected in comparing various kinds of dyed fabrics, the one having the largest openings between the threads transmits the most ultra-violet.</p>                                                                                                                                                                                                                                                                                                                                          |      |      |                                                  |                                                                                                                                                                                                                    |
| 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | RP7  | 1928 | Bruce, H.D.                                      | Tinting strength of pigments. B.S. Jour. Research, vol.1, pp. 125-150; August 1928. 10¢                                                                                                                            |
| <p>A new method and mode of expressing the results are suggested based upon spectrophotometric or photometric measurements of the degree of departure in purity or brightness of a tint from a standard achromatic pigment. Experimental data are offered descriptive of a relationship between the composition of a pigment mixture and the colorimetric purity or brightness of the tint. The procedure employed for specifying color in monochromatic terms is briefly explained.</p>                                                                                                                                                                     |      |      |                                                  |                                                                                                                                                                                                                    |
| 31                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      | 1928 | Appel, W.D.<br>Smith, W.C.<br>Christison, H.     | A machine for laboratory washing tests. Am. Dyestuff Repr., vol. 17, pp. 679-683; October 29, 1928.                                                                                                                |
| <p>Co-operative work by the American Association of Textile Chemists and Colorists and the Bureau of Standards has resulted in a practical machine for testing the fastness to washing of dyed textiles. With it one man may test up to twenty samples simultaneously and in a brief run obtain results similar to those obtained in commercial laundry practice. It is also suitable for testing detergents, for drycleaning tests and for laboratory dyeing. The machine is described and general specifications for it and for a standard washing procedure are given. The machine is being manufactured and may be obtained through the Association.</p> |      |      |                                                  |                                                                                                                                                                                                                    |
| 32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      | 1928 | Appel, W.D.                                      | Progress in the standardization of tests for fastness to light. Am. Dyestuff Repr., vol. 17, pp. 755-759; November 26, 1928.                                                                                       |
| <p>A review of the work of the past four years.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |      |                                                  |                                                                                                                                                                                                                    |
| 33                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      | 1929 | Appel, W.D.<br>Bentzen, Th.C.                    | Fastness to light of colored paper. Paper Trade J., vol. 88, No.9, p.42; February 28, 1929.                                                                                                                        |
| <p>Suggestions are given for testing the fastness to light of colored paper.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |      |                                                  |                                                                                                                                                                                                                    |
| 34                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | RP47 | 1929 | Brode, W.R.                                      | The spectral absorption of certain monazo dyes: I. The effect of position isomerism on the spectral absorption of methyl derivatives of benzenazophenol. B.S. Jour. Research, vol. 2, pp. 501-540; March 1929. 15¢ |
| <p>Quantitative measurements of the spectral absorption of solutions of azobenzene, benzoazophenol, and the mono- and dimethyl derivatives of benzenazophenol in alcohol, aqueous hydrochloric acid and aqueous sodium hydroxide are recorded and their relationships discussed. Although the differences found in the spectral absorption of alcohol solutions or of hydrochloric acid solutions of the position isomers studied are small, marked differences are found in the absorption of 3 per cent aqueous sodium hydroxide solutions.</p>                                                                                                            |      |      |                                                  |                                                                                                                                                                                                                    |



- | Ref. | Pub.               | Year | Author                    | Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| 35   |                    | 1929 | McNicholas, H.J.          | The absorptive properties of carotin and xanthophyll in the visible and ultraviolet. J. Optical Soc. Am., vol. 18, p. 172; March 1929.<br>Abstract of a paper presented at the Michelson Meeting of the Optical Society of America, Washington, D.C., November 1928. See RP337, ref. 49, for a complete report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 36   |                    | 1929 | Brode, W.R.               | Relation between the absorption spectra and chemical constitution of certain azo dyes. I: The effect of position isomerism on the absorption spectra of methyl derivatives of benzenazophenol. J. Am. Chem. Soc., vol. 51, pp. 1204-1213; April 1929. See RP47, ref. 34, for a more detailed report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 37   | TNB 145<br>TNB 148 | 1929 |                           | Fading of dyed textiles in daylight and in carbon arc light. TNB No. 145, pp. 45-46, No. 148, pp. 81-82; May and August 1929.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 38   |                    | 1929 | Appel, W.D.               | Quantitative relation between the spectral reflection of textile dyeings and the amount of dye used. Published by Textile Research Council, Statler Bldg., Boston, Mass. 5 pp. May 24, 1929.<br>A brief outline of a method for studying the relation between the spectral reflection of textile dyeings and the amount of dye used is given. The spectral reflection of a few dyeings can be used to predict the spectral reflection of dyeings made with any practical amount of dye. The reflection of dyeings made with a mixture of dyes can be calculated from the reflection data for dyeings of the components of the mixture.                                                                                                                                                                                                                |
| 39   |                    | 1929 | Cady, W.H.<br>Appel, W.D. | Report of the Subcommittee on Light Fastness: 3. The fading of dyed textiles in daylight and in carbon arc light. An. Dyestuff Repr., vol. 18, pp. 407-446; June 24, 1929.<br>Twelve-hundred and fifty-two specially prepared dyeings on cotton, wool, silk and weighted silk, representing some 381 different coloring matters, were exposed to daylight in several different ways and to the light from a glass-enclosed carbon arc. Each sample was exposed for four different periods of time. In general, slight fading occurred in the first period, decided fading in the fourth, and intermediate amounts of fading in the other two. The methods of exposure and of studying the results, and the details of the results obtained are given. Miscellaneous observations on the peculiarities in behavior of individual dyeings are recorded. |

| Ref. | Pub.     | Year | Author                       | Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| 40   | RP80     | 1929 | Eichlin, A.S.                | Fastness of dyed fabrics to drycleaning. B.S. Jour. Research, vol. 3, pp. 39-51; July 1929. 5 ¢                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|      |          |      |                              | Representative dyestuffs on wool, silk, cotton, rayon, and union fabrics were subjected to cleaning with moisture-free Stoddard solvent and with solvent containing 0.1 per cent free moisture and 0.01 per cent alkali. The apparatus used was a convenient substitute for a commercial drycleaning machine. The majority of dyes likely to be encountered are not affected but the basic dyes offer poor resistance to drycleaning. In order to minimize the danger of change in color during drycleaning, it is advisable to keep the solvent as free as practicable from moisture and alkali. |
| 41   | CS16-29  | 1929 |                              | Wall paper. 12 pp. August 1, 1929. 5 ¢                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|      |          |      |                              | This specification covers wall papers known in the trade as printed, plain, embossed papers, plastics, engraved papers and varnished tiles. The minimum quality level established includes color fastness requirements.                                                                                                                                                                                                                                                                                                                                                                           |
| 42   | RP100    | 1929 | Appel, W.D.<br>Reed, R.F.    | Light Fastness of lithographic ink pigments. B. S. Jour. Research, vol. 3, pp. 359-374; September 1929. 10 ¢                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|      |          |      |                              | One hundred and thirty-six specially prepared lithographic prints representing 31 pigments were exposed to daylight in several different ways and to the light from a glass-enclosed carbon arc. The fading observed is reported in this paper and a classification of the fastness of the pigments as used in lithographic inks is given.                                                                                                                                                                                                                                                        |
| 43   |          | 1929 | Reed, R.F.<br>Appel; W.D.    | The light-fastness of lithographic ink pigments. Lithographic Technical Foundation Bull. 4, Research Series 4. See ref. 42.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 44   | RP173    | 1930 | Carroll, B.H.<br>Hubbard, D. | Spectral sensitization of photographic emulsions. Notes on bathing with pinacyanol-pinaflavol mixtures. B. S. Jour. Research, vol. 4, pp. 693-701; May 1930.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|      |          |      |                              | Data are given for sensitization of three emulsions with pinacyanol-pinaflavol mixtures, with varying concentrations of dyes and with the addition of pyridine or borax. Pyridine is found to be useful, since it both increases the effectiveness of sensitization, and reduces the tendency to flocculation which may be a serious difficulty when pinaflavol is mixed with other sensitizing dyes. Specific conditions for bathing are recommended.                                                                                                                                            |
| 45   | CSM      | 1930 | Waters, C.E.                 | Testing typewriter ribbons CSM vol. 7, pp. 26-27; July 1930.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 46   | Yearbook | 1930 | Scott; W.M.<br>Appel, W.D.   | Bibliography of color with special reference to textiles and dyes. Am. Assoc. Textile Chemists & Colorists 1930 Yearbook, pp. 146-163.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

Supplementary bibliographies are published in subsequent yearbooks.

| Ref. | Pub.   | Year | Author                                   | Title                                                                                                                                             |
|------|--------|------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 47   | CSM    | 1930 | Appel, W.D.                              | Standardization of tests for fastness of colored textiles. CSM; vol. 7, pp. 86-87, September 1930.                                                |
| 48   | TNB170 | 1931 |                                          | Fastness to light of dyed textiles. TNB, No. 170, p. 61; June 1931.                                                                               |
| 49   |        | 1931 | Cady, W.H.<br>Smith, W.C.<br>Appel, W.D. | Classification of the fastness of dyed textiles in the standard sunlight exposure tests. Am. Dyestuff Reptr., vol. 20, pp. 359-380; June 8, 1931. |

The relative fastness to light of 1196 cotton, wool, silk and weighted silk dyeings, representing 366 dyestuffs was determined by exposing them to sunlight in the standard "sun test" of the American Association of Textile Chemists and Colorists. Tables showing the classification of the dyeings into seven fastness classes and an exposition of the method of classification are given. The paper should be of special interest to producers and users of dyestuffs.

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| 50 | RP337 | 1931 | McNicholas, H.J. | The visible and ultraviolet absorption spectra of carotin and xanthophyll and the changes accompanying oxidation, B.S. Jour. Research, vol. 7, pp. 171-193; July 1931. |
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The absorption spectra of pure carotin and xanthophyll throughout the visible and ultraviolet range are given. The changes in these spectra were followed as the pigments oxidized slowly in solution.

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| 51 | TNB173 | 1931 |  | Glass globes for lamp in testing color fastness. TNB, No. 173, p. 98; September 1931. |
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|----|--|------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 52 |  | 1931 | Cady, W.H.<br>Smith, W.C. | Report of Subcommittee on Light Fastness:<br>V. Fade-Ometer tests with a Corex-D globe. Am. Dyestuff Reptr., vol. 20, pp. 754-756; November 23, 1931. |
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Duplicate sets of samples from 40 selected dyeings were exposed in the Fade-Ometer with a plain glass globe for one set and globe of Corex-D glass for the other set. Comparisons of the faded samples indicate that the use of a Corex-D globe instead of a plain glass globe will not materially affect the results of fastness tests.

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| 53 |  | 1932 |  | A report of the spectral reflection of eleven samples of dyed cloth (Report prepared by Colorimetry Section, Bureau of Standards). Am. Dyestuff Reptr., vol. 21, pp. 163-166; February 29, 1932. |
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This report provides a permanent quantitative record of the spectral reflection of the dyeings prepared by the American Association of Textile Chemists and Colorists representing four standards of fastness to washing of dyed silk. The spectral reflections of some of the dyeings after washing according to the standard methods of the Association are given.



| Ref. | Pub.  | Year | Author                           | Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| 54   | LC331 | 1932 |                                  | Inks. 12 pp. June 9, 1932.<br>This circular gives formulas for the standard inks in several Federal Specifications and selected formulas of inks for which there are no specifications. It supersedes C95 (see ref. 6 and 12) and is superseded by C400, ref. 62.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 55   | RP473 | 1932 | Meggers, W.F.<br>Kiess, C.C.     | Infra-red arc spectra photographed with xenocyanine. B.S.Jour. Research, vol.9, pp. 309-326; September, 1932.<br>A new sensitizing dye, xenocyanine, has made possible the preparation of plates highly sensitive to infra-red light ranging in wave length from 8000 to 11000A. This paper describes the use of these plates for studying the infra-red arc spectra of Ti, Fe, Co, Ni, and Zr. No information regarding the nature of the dye is given.                                                                                                                                                                                                                                                       |
| 56   | RP488 | 1932 | Carroll, B. H.<br>Hubbard, D.    | The photographic emulsion; variables in sensitization by dyes. B.S.Jour. Research, vol. 9, pp. 529-545; October 1932. 5 p<br>Sensitization by four typical dyes has been studied under conditions showing the effect of the following variables: Concentration of dyes, formation of sensitivity nuclei, hydrogen ion concentration, and silver ion concentration. In general, sensitization by all dyes tends to increase with increasing silver ion concentration, but there are significant differences between individual dyes which may be predicted from the hypothesis that adsorption of the ion of the dye to the oppositely charged ion of the silver bromide lattice is essential to sensitization. |
| 57   | LC358 | 1933 |                                  | Color charts. 3 pp. February 9, 1933. Obtainable from Bureau of Standards on request.<br>This letter circular provides a list of color charts issued or used by some branch of the United States Government.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 58   | RP525 | 1933 | Carroll, B.H.<br>Hubbard, D.     | The photographic emulsion: The mechanism of hypersensitization. B.S.Jour. Research, vol. 10, pp. 211-228; February 1933. 5p<br>Investigation of the physical chemistry of the photographic "hypersensitization" process, used to increase the effectiveness of sensitization by dyes.                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 59   | RP541 | 1933 | Carroll, B.H.<br>Kretchman, C.M. | Photographic reversal by desensitizing dyes. B.S.Jour. Research, vol. 10, pp 449-464; April 1933.<br>Latent image on a photographic plate which has been exposed, then bathed in a solution of a desensitizing dye, may be destroyed by a second exposure to light of the proper wave length. Quantitative measurements are reported of the variation of density with wave length made on plates treated with the desensitizing dyes, pinakryptol green, pinakryptol yellow, fuchsin, safranin and 2-m-nitrostyrylquinoline dimethyl sulfate. The photographic effect is shown to be directly related to the absorption of light by the dyed plate.                                                            |



| Ref. | Pub. | Year | Author          | Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| 60   |      | 1933 |                 | Federal Specification No. CCC-T-191. Textiles; test methods, 14 pp. May 2, 1933. 5¢                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|      |      |      |                 | The methods used for testing the fastness of dyed textiles for conformance with the requirements of Federal Specifications are given. The tests include fastness to light; weather; laundering (washing) of cotton materials and of materials containing wool, silk or rayon; water; salt water and soap; crocking; and perspiration.                                                                                                                                                                                                                                                                                                                                                                 |
| 61   |      | 1933 | Zimmerman, E.W. | Colored waterproof drawing inks. Ind. Eng. Chem., vol. 25, pp.1033-1034; September 1933.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|      |      |      |                 | A method for preparing a set of water-fast drawing inks is described. The inks consist of a 5 percent solution of shellac and a suitable dye. The shellac is held in solution by ammonium hydroxide and a small amount of borax. Seven dyes, each of a different color, selected from a list of ninety-two as the most suitable for making water-fast inks, are listed. Methods of testing water-fast inks are outlined.                                                                                                                                                                                                                                                                              |
| 62   |      | 1933 | Waters, C.E.    | Blue dye as evidence of the age of writing. Ind. Eng. Chem., vol. 25, pp.1034-1035; September 1933.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|      |      |      |                 | Contrary to statements made by experts on disputed documents that the blue dye in writing done with ordinary blue-black ink will all be oxidized away in 15 years, examination of 147 samples of writing older than 15 years showed that blue dye was to be found in 78 of them. The oldest samples in which dye was detected were written in 1881. It is not possible to conclude from the presence or absence of dye that one sample of writing is more recent or older than another.                                                                                                                                                                                                               |
| 63   | C400 | 1933 | Waters, C.E.    | Inks. 38 pp. 10¢                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|      |      |      |                 | This circular outlines briefly the history of iron gallotannate writing inks, give formulas for three kinds of them, and discusses briefly aging of writing and the restoration of faded writing. Various other kinds of ink, including carbon inks, dye inks for writing, Prussian blue, colored drawing, show-card, hectograph, stamp-pad, recording, indelible marking and sympathetic inks, and inks for various special surfaces are briefly discussed and formulas are given for most of them. The methods of testing in the Federal Specifications are given. In the appendix is a section on dyes suitable for a variety of inks. This circular supersedes C95 and LC331 (ref.6, 12, and 54). |

