



Designation: D 3897 – 91 (Reapproved 2001)

Standard Practice for Calculation of Basicity of Chrome Tanning Liquors¹

This standard is issued under the fixed designation D 3897; 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 practice is intended to show how the results of the chromium analysis (Test Method D 3898) and the acidity determination (Test Method D 3913) can be combined to permit calculation of the basicity of a chrome tanning liquor.

1.2 *This standard does not purport to address all of the safety concerns, 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. Referenced Documents

2.1 ASTM Standards:

D 3898 Test Method for Chromic Oxide in Basic Chromium Tanning Liquors²

D 3913 Test Method for Acidity in Basic Chromium Tanning Liquors²

E 180 Practice for Determining the Precision of ASTM Methods for the Analysis and Testing of Industrial Chemicals³

3. Significance and Use

3.1 Basicity is a ratio. In any chromic salt solution, the electrovalence of the chromium (+3) is satisfied by the hydroxyl ions and by acid ions. The extent to which this electrovalence is satisfied by the hydroxyl ions, expressed as a percentage, is the basicity. The basicity of a chrome tanning liquid is closely related to the tanning behavior of the solution.

4. Procedure

4.1 Determine the chromic oxide as described in Test Method D 3898. Determine the acid as described in Test Method D 3913.

5. Results

5.1 The basicity of the liquor shall be expressed according to the Schorlemmer system. In this system, the basicity is the

per cent of the total chromic oxide that is combined with hydroxyl and is calculated as follows:

$$\text{Basicity, \%} = \frac{A - B}{A} \times 100 \quad (1)$$

where:

A = the amount of thiosulfate, as mL of 0.1 N solution required to titrate the 25 mL aliquot as the specimen in Test Method D 3898,

B = the amount of sodium hydroxide, as mL of 0.1 N solution required to titrate the 25 mL aliquot of the specimen in Test Method D 3913.

6. Precision and Bias

6.1 Because basicity is in effect a ratio, the precision indexes are transmitted by the laws governing ratios. If the precision of accuracy of the chromic oxide determination or of the titratable acidity is expressed in the same relative units; for example, percent of value being determined, the precision with which the basicity is known will be:

$$P_B = \sqrt{P_{C_R}^2 + P_A^2} \quad (2)$$

where:

P_A = precision of acidity in basic chromium tanning liquors,

P_{C_R} = precision of chromic oxide in basic chromium tanning liquors,

P_B = precision of basicity in basic chromium tanning liquors.

6.2 For the reported reproducibility figures for the chromic oxide from Test Method D 3898 ($\delta = 0.90\%$) and for acidity from Test Method D 3913 (Procedure I, $\sigma = 1.84\%$), δ_B is given as 2.05%. This number has the units of basicity. Similarly, repeatability has $\delta = 0.52\%$ basicity. Caution should be employed in insisting on extremely close agreements between laboratories or replicates unless a background of high precision has been established.⁴

7. Keywords

7.1 basicity; chrome tanning liquor; Schorlemmer

¹ This practice is under the jurisdiction of ASTM Committee D31 on Leather and is the direct responsibility of Subcommittee D31.06 on Chemical Analysis-General. Current edition approved May 15, 1991. Published July 1991.

² Annual Book of ASTM Standards, Vol 15.04.

³ Annual Book of ASTM Standards, Vol 15.05.

⁴ Hartford, W. H., *The Journal of the Leather Chemists Assoc.*, Vol 56, 1961, p. 568.