



National Institute of Standards & Technology

# Certificate of Analysis

Standard Reference Material<sup>®</sup> 3183

Standard Solution

Fluoride Anion

Lot Code 792706

This Standard Reference Material (SRM) is intended primarily for use in anion ion chromatography or any other analytical technique that requires aqueous standard solutions for calibration or as control samples. SRM 3183 is a single component solution prepared gravimetrically to contain a nominal 1 000 mg/kg of fluoride dissolved in filtered (0.22  $\mu\text{m}$ ) 18 megohm water.

Certified Value ( $Y$ ) of Fluoride: 1 004 mg/kg  $\pm$  6 mg/kg at 22 °C

The certified value ( $Y$ ) is based on 1) gravimetric preparation using high purity sodium fluoride and on, 2) ion chromatography calibrated using two independently prepared gravimetric solutions. The value has been adjusted upward by 0.1 % relative, based on estimated transpiration losses of solvent through the container walls of 0.2 % relative per year.

The uncertainty in the certified value is calculated as

$$U = (2u_c + 0.001Y + B) \text{ mg/kg}$$

where  $u_c$  is the "combined standard uncertainty" calculated according to the ISO Guide [1] and the procedure of Schiller and Eberhardt for combining independent analytical methods [2]. The value of  $u_c$  is intended to represent, at the level of one standard deviation, the combined effect of uncertainty components associated with gravimetric factors, as well as the purity of the starting material and the uncertainty associated with the analytical method. The quantity,  $0.001Y$ , is an allowance for transpiration of the solution through the container walls, which is estimated to be  $\pm$  0.1 % of the certified value during the one-year period of validity of the certification. The quantity,  $B$ , is an allowance for between method differences.

**Expiration of Certification:** The certification of SRM 3183 Lot No. 792706 is valid, within the measurement uncertainty specified, until 01 July 1999, provided the SRM is handled in accordance with instructions given in this certificate (see Instructions for Use). This certification is nullified if the SRM is damaged, contaminated, or modified.

**Maintenance of Certification:** NIST will monitor representative solutions from this SRM lot over the period of its certification. If substantive changes occur that affect the certification before the expiration of certification, NIST will notify the purchaser. Return of the attached registration card will facilitate notification.

This SRM was prepared gravimetrically by T.A. Butler and analyzed using ion chromatography by J.M. Smeller of the NIST Analytical Chemistry Division.

Statistical consultation was provided by K.R. Eberhardt of the NIST Statistical Engineering Division.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, MD 20899  
Certificate Issue Date: 22 August 1997

Thomas E. Gills, Chief  
Standard Reference Materials Program

## Instructions for Use

This SRM solution should be kept tightly capped and stored under normal laboratory conditions when not in use.

**Preparation of Working Standard Solutions by Mass:** Each diluted working standard solution should be prepared by transferring an aliquot of the SRM to an empty, dry, preweighed polyethylene bottle, and then reweighing the bottle. The dilution need not be exact since the mass of the empty bottle, mass of the bottle plus SRM aliquot, and the final diluted mass of the solution will permit calculation of the exact concentration of the working solution. Dilutions prepared gravimetrically as described will need no correction for temperature and no further correction for true concentration in vacuum. Dilute SRM solution concentration will be in mg/kg units. Volumetric dilutions are not recommended due to uncertainties in volume calibrations and variations in density. However, for user convenience, a procedure for volumetric preparation that will minimize the major sources of error, is given below.

**Preparation of Working Standard Solutions by Volume:** Each diluted working standard solution should be prepared by transferring an aliquot of the SRM to an empty, dry polyethylene bottle and then weighing the bottle. The solution must now be transferred to a Class A volumetric flask and the polyethylene bottle reweighed to determine the exact mass of SRM solution transferred. The solution in the flask is then diluted to 99 % + of volume, mixed thoroughly, and the remaining few drops needed to dilute to exact volume carefully added. The concentration (in mg/mL) of the resulting diluted working standard solution can then be calculated by multiplying the mass (in g) of the SRM solution amount by the SRM certified value (in mg/kg), and dividing the numerical product by the calibrated volume (in mL) of the flask used for dilution. If the analyst follows this procedure, no correction for density is needed and although the concentration of the resulting working standard solution may be an uneven fraction of the original SRM concentration, it will be known as accurately as a volumetric dilution permits.

## REFERENCES

- [1] *Guide to the Expression of Uncertainty in Measurement*, ISBN 92-67-10188-9, 1st Ed. ISO, Geneva, Switzerland, (1993): see also Taylor, B.N. and Kuyatt, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results," NIST Technical Note 1297, U.S. Government Printing Office, Washington DC, (1994).
- [2] Schiller, S.B. and Eberhardt, K.R., "Combining Data from Independent Chemical Analysis Methods," *Spectrochimica Acta*, Vol. **46B**, No. 12, pp. 1607-1613, (1991).

*It is the responsibility of users of this SRM to assure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: Phone (301) 975-6776 (select "Certificates"), Fax: (301) 926-4751, e-mail: srminfo@nist.gov, or WWW: <http://ts.nist.gov/srm>.*