



Designation: D7980 – 15 (Reapproved 2023)

Standard Guide for Ion-Chromatographic Analysis of Anions in Grab Samples of Ultrapure Water (UPW) in the Semiconductor Industry¹

This standard is issued under the fixed designation D7980; 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 guide applies to ultrapure water that is thought to contain low ppt (parts-per-trillion, weight/weight) levels of anionic contaminants (for example, bromide, chloride, fluoride, nitrate, nitrite, phosphate, and sulfate). To minimize carry-over problems between analyses, it is best to limit the concentration of any one contaminant to approximately 200 ppt (although this limit is only an approximation and may vary, depending on the user's application).

1.2 This guide is intended to help analysts avoid contamination of ultrapure-water samples, since contamination control is the primary challenge when quantifying ppt-level anions in grab samples.

1.3 This guide does not include recommendations for collecting samples from the water source.

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D1129 Terminology Relating to Water

D5127 Guide for Ultra-Pure Water Used in the Electronics and Semiconductor Industries

¹ This guide is under the jurisdiction of ASTM Committee D19 on Water and is the direct responsibility of Subcommittee D19.05 on Inorganic Constituents in Water.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this standard, refer to Terminology **D1129**.

3.2 *Acronyms:*

3.2.1 *HDPE, n*—high-density polyethylene

3.2.2 *IC, n*—ion chromatograph

3.2.3 *PEEK, n*—polyether ether ketone

3.2.4 *ppb, n*—parts-per-billion (weight/weight)

3.2.5 *ppt, n*—parts-per-trillion (weight/weight)

3.2.6 *UPW, n*—ultrapure water

4. Significance and Use

4.1 This guide is intended to help analysts in the semiconductor industry. Examples of the usefulness of anion monitoring include: (1) determining when ion-exchange resin beds (in water-purification systems) need to be regenerated, and (2) ensuring that anion levels are low enough to allow the water to be used for the manufacture of semiconductor devices.

4.2 To ensure that the anions are indeed at low-ppt levels, it is recommended to check the conductivity of a subsample before proceeding with Section 5 of this guide. This check does not need to be exact; its purpose is simply to let the analyst know if the conductivity is higher than that of the highest-level standard solution being tested. Any high reading signifies that the sample, if analyzed, might contaminate the instrument.

5. Guidelines

5.1 *General Considerations:*

5.1.1 In working with grab samples of ultrapure water, concentrate on controlling contamination, which is the overriding challenge when analyzing for anions in UPW. Precautions must be taken, including the following. Wear gloves (for example, nitrile) that do not shed anions. Do not touch anything that might contact the samples. Minimize anionic contamination in the laboratory air; for example, do not work in the same lab where concentrated mineral acids are being used or where acid fumes might be brought in by means of the ventilation system.