



Standard Practices for Identification of Crystalline Compounds in Water-Formed Deposits By X-Ray Diffraction¹

This standard is issued under the fixed designation D 934; 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 These practices provide for X-ray diffraction analysis of powdered crystalline compounds in water-formed deposits. Two are given as follows:

	Sections
Practice A—Camera	12 to 21
Practice B—Diffractometer	22 to 30

1.2 Both practices yield qualitative identification of crystalline components of water-formed deposits for which X-ray diffraction data are available or can be obtained. Greater difficulty is encountered in identification when the number of crystalline components increases.

1.3 Amorphous phases cannot be identified without special treatment. Oils, greases, and most organic decomposition products are not identifiable.

1.4 The sensitivity for a given component varies with a combination of such factors as density, degree of crystallization, particle size, coincidence of strong lines of components and the kind and arrangement of the atoms of the components. Minimum percentages for identification may therefore range from 1 to 40 %.

1.5 *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 consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific precautionary statements are given in Section 8 and Note 20.

2. Referenced Documents

2.1 ASTM Standards:²

D887 Practices for Sampling Water-Formed Deposits

D933 Practice for Reporting Results of Examination and

¹ These practices are under the jurisdiction of ASTM Committee D19 on Water and are the direct responsibility of Subcommittee D19.03 on Sampling of Water and Water-Formed Deposits, Analysis of Water for Power Generation and Process Use, On-Line Water Analysis, and Surveillance of Water.

Current edition approved July 3, 1980. Published November 1980. Originally approved in 1947. Last previous edition approved in 1980 as D 934 – 80.

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.

Analysis of Water-Formed Deposits

D1129 Terminology Relating to Water

D1193 Specification for Reagent Water

D2331 Practices for Preparation and Preliminary Testing of Water-Formed Deposits

E11 Specification for Wire Cloth Sieves for Testing Purposes

3. Terminology

3.1 *Definitions*—For definitions of terms used in these practices, refer to Terminology D 1129.

4. Summary of Practices

4.1 Powdered samples are irradiated with a monochromatic X-ray beam of short wavelength (from about 0.05 to 0.25 nm). The X rays interact with the atoms in the crystal and are scattered in a unique diffraction pattern which produces a fingerprint of the crystal's atomic or molecular structure. The analytical instrumentation used in X-ray diffraction includes the powder camera and the diffractometer **(1), (2), (3), (4), (5)**.³

5. Significance and Use

5.1 The identification of the crystalline structures in water-formed deposits assists in the determination of the deposit sources and mode of deposition. This information may lead to measures for the elimination or reduction of the water-formed deposits.

6. Purity of Reagents

6.1 Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.⁴ Other grades may be used,

³ The boldface numbers in parentheses refer to the references listed at the end of these practices.

⁴ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmaceutical Convention, Inc. (USPC), Rockville, MD.

