Designation: C1571 – 03 (Reapproved 2012)

Standard Guide for Characterization of Radioactive and/or Hazardous Wastes for Thermal Treatment[1]

This standard is issued under the fixed designation C1571; 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 identifies methods to determine the physical and chemical characteristics of radioactive and/or hazardous wastes before a waste is processed at high temperatures, for example, vitrification into a homogeneous glass ,glass-ceramic, or ceramic waste form. This includes waste forms produced by ex-situ vitrification (ESV), in-situ vitrification (ISV), slagging, plasma-arc, hot-isostatic pressing (HIP) and/or cold-pressing and sintering technologies. Note that this guide does not specifically address high temperature waste treatment by incineration but several of the analyses described in this guide may be useful diagnostic methods to determine incinerator off-gas composition and concentrations.

The characterization of the waste(s) recommended in this guide can be used to (*1*) choose and develop the appropriate thermal treatment methodology, (*2*) determine if waste pretreatment is needed prior to thermal treatment, (*3*) aid in development of thermal treatment process control, (*4*) develop surrogate waste formulations, (*5*) perform treatability studies, (*6*) determine processing regions (envelopes) of acceptable waste form composition, (*7*) perform pilot scale testing with actual or surrogate waste, and/or (*8*) determine the composition and concentrations of off-gas species for regulatory compliance.

The analyses discussed in this standard can be performed by a variety of techniques depending on equipment availability. For example, Gas Chromatograph Mass Spectrometry (GC/MS) can be used to measure the amount and type of off-gas species present. However, this standard assumes that such sophisticated equipment is unavailable for radioactive or hazardous waste service due to potential contamination of the equipment. The analyses recommended are, therefore, the simplest and least costly analyses that can be performed and still be considered adequate

1.2 This guide is applicable to radioactive and/or hazardous wastes including but not limited to, high-level wastes,[2] low-level wastes,[3] transuranic (TRU) wastes, hazardous wastes, mixed (hazardous and radioactive) wastes, heavy metal contaminated wastes, and naturally occurring or accelerator produced radioactive material (NARM or NORM) wastes. These wastes can be in the physical form of wet sludges, dried sludges, spent waste water filter aids, waste water filter cakes, incinerator ashes (wet or dry), incinerator blowdown (wet or dry), wastewaters, asbestos, resins, zeolites, soils, unset or unsatisfactory cementitious wastes forms in need of remediation, lead paint wastes, etc. and combinations of the above. This guide may not be applicable to piping, duct work, rubble, debris waste or wastes containing these components.

1.3 This guide references applicable test methods that can be used to characterize hazardous wastes, radioactive wastes, and heavy metal contaminated process wastes, waste forms, NARM or NORM wastes, and soils.

1.4 These test methods must be performed in accordance with all quality assurance requirements for acceptance of the data.

1.5 *This standard may involve hazardous materials, operations, and equipment. 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:*[4]

C92 Test Methods for Sieve Analysis and Water Content of Refractory Materials

C146 Test Methods for Chemical Analysis of Glass Sand

C162 Terminology of Glass and Glass Products

[1] This guide is under the jurisdiction of ASTM Committee C26 on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee C26.07 on Waste Materials.

Current edition approved Jan. 1, 2012. Published January 2012. Originally approved in 2003. Last previous edition approved in 2003 as C1571–03. DOI: 10.1520/C1571-03R12.

[2] High level waste (HLW) is used as a generic term that includes high level liquid waste (HLLW) and high level radioactive waste (HRW).

[3] Low level waste (LLW) is used as a generic term that includes low level liquid waste (LLLW), low level radioactive waste (LLRW) and low activity waste (LAW).

[4] 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.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. United States

Documents
Document Sharing Hub
Full document details: ASTM C1571-03(2012)

C169 Test Methods for Chemical Analysis of Soda-Lime and Borosilicate Glass
C242 Terminology of Ceramic Whitewares and Related Products
C859 Terminology Relating to Nuclear Materials
C1109 Practice for Analysis of Aqueous Leachates from Nuclear Waste Materials Using Inductively Coupled Plasma-Atomic Emission Spectroscopy
C1111 Test Method for Determining Elements in Waste Streams by Inductively Coupled Plasma-Atomic Emission Spectroscopy
C1168 Practice for Preparation and Dissolution of Plutonium Materials for Analysis
C1317 Practice for Dissolution of Silicate or Acid-Resistant Matrix Samples (Withdrawn 2001)[5]
C1463 Practices for Dissolving Glass Containing Radioactive and Mixed Waste for Chemical and Radiochemical Analysis
D1129 Terminology Relating to Water
D4327 Test Method for Anions in Water by Suppressed Ion Chromatography

2.2 *Other Documents:*

US EPA Standard SW846, Test Methods for Evaluating Solid Waste
Resource Conservation and Recovery Act (RCRA), 40CFR 240-271, November 21, 1976
DOE Methods for Evaluating Environmental and Waste Management Samples, March, 1993, DOE.EM-0089T, Rev. 1
Radioanalytical Technology for 10 CFR Part 61 and Other Selected Radionuclides, Literature Review, C. W. Thomas, V. W. Thomas, and D. E. Robertson, PNNL-9444, March, 1996

3. Terminology

3.1 *Definitions:*

3.1.1 *analysis (physical or chemical)*—the determination of physical or chemical properties or composition of a material. **C859**

3.1.2 *byproduct material*—the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processsed primarily for its source material content, including discrete surface wastes, resulting from uranium solution extraction processes. Underground ore bodies depleted by such solution extraction operations do not constitute "byproduct material." **10 CFR Part 40**

NOTE 1—A supplementary definition can be found in 10 CFR Part 20; any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the process of producing or utilizing special nuclear material.

3.1.3 *calcine*—to fire or heat a granular or particulate solid at less than, fusion temperature but sufficient to remove most of its chemically combined volatile matter (for example, H_2O, CO_2) and otherwise to develop the desired properties for use.[6]

3.1.4 *debris waste*—solid material exceeding a 60mm particle size that is intended for disposal and that is: a manufactured object; or plant or animal matter; or natural geologic material.[7]

3.1.5 *devitrification*—crystallization of glass. **C162**

3.1.6 *drying*—removal by evaporation, of uncombined water or other volatile substances from a ceramic raw material or product, usually expedited by low-temperature heating. **C242**

3.1.7 *geologic mill tailings*—common rock leftover from mining or oil well drilling operations that may contain hazardous or radioactive constituents, can include natural occurring radioactive material (NORM).

3.1.8 *glass ceramic*—solid material, partly crystalline and partly glass. **C162**

3.1.9 *hazardous waste*—(*a*) in a broad sense, any substance or mixture of substances having properties capable of producing adverse effects on the health or safety of a human (see also RCRA hazardous waste); (*b*) any waste that is "listed" in 40CFR Parts 261.31-261.33 or exhibits one or more of the characteristics identified in 40CFR Parts 261.20–261.24, is a mixture of hazardous and nonhazardous waste, or is determined to be hazardous waste by the generator.

3.1.10 *heavy metal contaminated waste*—a common hazardous waste; can damage organisms at low concentrations and tends to accumulate in the food chain. Examples are lead, chromium, cadmium, and mercury.

3.1.11 *high-level liquid waste (HLLW)*—the radioactive aqueous waste resulting from the operation of the first cycle extraction system, or equivalent concentrated wastes from subsequent extraction cycles, or equivalent wastes from a process not using solvent extraction, in a facility for processing irradiated reactor fuels.

3.1.12 *high-level radioactive waste (HLRW or HLW)*—(*a*) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products (U.S. Code Title 42, Section 10101); (*b*) liquid wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuel.

3.1.13 *homogeneous glass*—(*1*) an inorganic product of fusion that has cooled to a rigid condition without crystallizing (see Terminology C162); (*2*) a noncrystalline solid or an amorphous solid.[8]

3.1.14 *incidental waste*—wastes that are not classified as HLW. NRC has defined three criteria that must be met for a waste to be called incidental waste: (*1*) wastes that have been processed (or will be further processed) to remove key radionuclides to the maximum extent that is technically and economically practical; (*2*) wastes that will be incorporated in a solid physical form at a concentration that does not exceed the

[5] The last approved version of this historical standard is referenced on www.astm.org.
[6] Perkins, W. W., (Ed.), *Ceramic Glossary*, The American Ceramic Society, 1984.
[7] *Code of Federal Regulations Title 40*, Volume 19, Part 268.
[8] Varshneya, A. K., "Fundamentals of Inorganic Glasses," Academic Press, Boston, MA, 1994.

AVA Documents
Document Sharing Hub

Full document details: ASTM C1571-03(2012)

applicable concentrations for Class C low-level waste; and (*3*) wastes that are to be managed pursuant of the Atomic Energy Act, so that safety requirements comparable to the performance objectives set out in 10 CFR Part 61, Subpart C are satisfied.

3.1.15 *infrared incinerator*—any enclosed device that uses electric powered resistance heaters as a source of radiant heat followed by an afterburner using controlled flame combustion and which is not listed as an industrial furnace **EPA 40 CFR 260.10**

3.1.16 *incineration*—(*1*) controlled flame combustion and neither meets the criteria for classification as a boiler, sludge dryer, or carbon regeneration unit, nor is listed as an industrial furnace; or (*2*) meets the definition of infrared incinerator or plasma arc incinerator **EPA 40 CFR 260.10**

3.1.17 *Joule heating*—heating of glass by passing an electric current through it, the powerful stirring effect of the convection currents created by electric heating causes uniformity of temperature throughout the body of glass and makes it physically homogeneous.[9]

3.1.18 *loss-on-heating (LOH)*—the percent loss in weight of a material at a constant temperature ≥105°C , and for a time long enough, to achieve constant weight, expressed as a percent of the initial weight of the dry material; The fractional or percentage weight loss of a material on heating in air from an initial defined state (usually, dried) to a specified temperature, such as 1000°C, and holding there for a specified period, such as 1 hour. Fixed procedures are designed, usually, such that LOH represents the loss of combined H_2O, CO_2, certain other volatile inorganics, and combustible organic matter.[6]

3.1.19 *low-activity waste*—the low-activity portion of HLLW that is separated from the HLLW so that it can be classified as LLW and be disposed of as "incidental waste."

3.1.20 *low-level radioactive waste (LLRW or LLW)*—(*a*) LLRW is waste that satisfies the definition of LLRW in the Radioactive Waste Policy Amendments Act of 1985; radioactive material that is not high-level radioactive waste, spent nuclear fuel, or byproduct material as given in the Atomic Energy Act of 1954; (*b*) Low level wastes are also not transuranic wastes as given in the Low Level Radioactive Waste policy Amendments Act and 10 CFR Part 61; (*c*) waste that (*1*) is not high-level radioactive waste, spent nuclear fuel, or byproduct material (as defined in section IIe(2) of the Atomic Energy Act of 1954, (42 U.S.C. 2014(e)(2))); and waste that (*2*) the NRC, consistent with existing law and in accordance with paragraph (a), classifies as low-level radioactive waste. Low-level radioactive waste (LLW) is a general term for a wide range of wastes. Industries, hospitals and medical, educational, or research institutions; private or government laboratories; and nuclear fuel cycle facilities (for example, nuclear power reactors and fuel fabrication plants) using radioactive materials generate low-level wastes as part of their normal operations. These wastes are generated in many physical and chemical forms and levels of contamination **10 CFR Part 61**

3.1.21 *mixed waste*—waste that contains both hazardous waste and source special nuclear or byproduct material subject to the Atomic Energy Act (AEA) of 1954;[10] The "radioactive component" refers only to the actual radionuclides dispersed or suspended in the waste substance.[11]

3.1.22 *mixed waste glass*—a glass comprised of glass forming additives and hazardous waste that contains radioactive constituents.

3.1.23 *natural accelerator produced radioactive materials (NARM)*—radioactive materials not covered under the Atomic Energy Act of 1954 that are naturally occurring or produced by an accelerator. Accelerators are used in sub-atomic particle physics research. These materials have been traditionally regulated by States. NARM waste with more than 2 nCi/g of ^{226}Ra or equivalent is commonly referred to as discrete NARM waste; below this threshold, the waste is referred to as diffuse NARM waste. NARM waste is not covered under the Atomic Energy Act, it is not a form of LLW, and it is not regulated by Nuclear Regulatory Commission.

3.1.24 *naturally occurring radioactive materials (NORM)*—NORM refers to materials not covered under the Atomic Energy Act whose radioactivity has been enhanced (radionuclide concentrations are either increased or redistributed where they are more likely to cause exposure to man) usually by mineral extraction or processing activities. Examples are exploration and production wastes from the oil and natural gas industry and phosphate slag piles from the phosphate mining industry. This term is not used to describe or discuss the natural radioactivity of rocks and soils, or background radiation, but instead refers to materials whose radioactivity is technologically enhanced by controllable practices. Note this definition is sometimes called technically enhanced NORM or TENORM.

3.1.25 *plasma arc incinerator*—any enclosed device using a high intensity electrical discharge or arc as a source of heat followed by an afterburner using controlled flame combustion and which is not listed as an industrial furnace. **EPA 40 CFR 260.10**

3.1.26 *radioactive*—of or exhibiting radioactivity;[12] a material giving or capable of giving off, radiant energy in the form of particles or rays, as alpha, beta, and gamma rays, by the disintegration of atomic nuclei; said of certain elements, such as radium, thorium, and uranium, and their products.[13]

3.1.27 *radioactivity*—spontaneous nuclear disintegration with emission of corpuscular or electromagnetic radiation, or both. **D1129**

3.1.28 *radioactive waste*—solid, liquid, and gaseous materials from nuclear operations that are radioactive or become

[9] Meigh, E., "Electric Melting in the Glass Industry," Chapter 7, A.G. Pincus and G.M. Kiken, Books for Industry, New York, NY, 1976.

[10] *Federal Facilities Compliance Act*, 1992, (RCRA Section 1004 (41,42,USC 6903)41)).

[11] *DOE Order 5400.3*.

[12] *The American Heritage Dictionary*, Houghton Mifflin, 2nd Edition, The World Publishing Co., New York, 1973.

[13] *Webster's New Twentieth Century Dictionary*, 1970.

AVA Documents
Document Sharing Hub

Full document details: ASTM C1571-03(2012)

radioactive and for which there is no further use. Wastes are generally classified as high-level (having radioactivity concentrations of thousands of curies per gallon or cubic foot), low-level (on the order of 1 microcurie per gallon or cubic foot), or intermediate level (between these extremes). **10 CFR Parts 60 and 61**

3.1.29 *residual radioactive material*—(*1*) waste (which the secretary of energy determines to be radioactive) in the form of tailings resulting from the processing of ores for the extraction of uranium and other valuable constituents of the ore; and (*2*) other waste (which the secretary of energy determines to be radioactive) at the processing site which relates to such processing, including any residual stock of unprocessed ores or low grade-materials. This term is used only with respect to materials at sites subject to remediation under Title I of the Uranium Mill Tailings Radiation Control Act of 1978, as amended. **10 CFR Part 40**

3.1.30 *RCRA hazardous waste*—a solid waste that exhibits a characteristic of a hazardous waste or is, or contains a listed hazardous waste. A RCRA solid waste may be a solid, liquid, or gas. **40 CFR Part 261.3**

3.1.31 *RCRA listed waste*—a solid waste that has been listed by EPA by virtue of its toxicity characteristics or because of the industrial process from which it is derived. **40 CFR Part 261.11**

3.1.32 *simulated waste glass*—a glass comprised of glass forming additives with simulants of, and/or actual chemical species in radioactive wastes, mixed wastes, or heavy metal wastes.

3.1.33 *slag*—glass that contains crystalline material including metal inclusions upon exiting a thermal treatment unit (see also *glass-ceramic*).

3.1.34 *sludge*—any solid, semi-solid, or liquid waste generated from a municipal, commercial, or industrial waste water treatment plant, water supply treatment plant, or air pollution control facility exclusive of the treated effluent from a waste-water treatment plant. **40 CFR 260.10**

3.1.35 *speciation*—a calculation of the chemical species (for example, oxides, hydroxides carbonates, sulfates in wt%) present in a waste based upon the elemental analyses of a waste (in wt%) in order to predict the fractionation of each species into the final wasteform or into the off-gas.

3.1.36 *treatability study*—a study in which a hazardous waste is subjected to a treatment process to determine (*1*) whether the waste is amenable to the treatment process, (*2*) what pretreatment is required, (*3*) optimal process conditions, (*4*) efficiency of a treatment process, and (*5*) characteristics and volumes of residuals. **40 CFR 260.10**

3.1.37 *TRU waste*—waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes, with half-lives greater than twenty years, per gram of waste, except for (*1*) high-level radioactive waste; (*2*) wastes that DOE has determined, with the concurrence of EPA, do not need the degree of isolation required by EPA's high level waste rule (40 CFR 191); or (*3*) has approved for disposal on a case-by-case basis in accordance with NRC's radioactive land disposal regulation (10 CFR Part 61). TRU is not generally found outside the DOE complex and is mainly produced from the reprocessing of spent nuclear fuel, nuclear weapons production, and reactor fuel assembly. TRU wastes mainly emit alpha particles as they break-down. DOE categorizes TRU as either Contact Handled (CH) or Remote Handled (RH) with RH being the more radioactive of the two.

3.1.38 *uranium milling*—any activity that results in the production of byproduct material.

3.1.39 *uranium mill tailings*—see *byproduct material* and/or *residual radioactive material*.

3.1.40 *vitrification*—the process of fusing waste or simulated waste with glass making chemicals at elevated temperatures to form a waste glass or a simulated waste glass. **C162**

3.1.41 *waste*—any residue containing radioactive or hazardous materials not currently considered useful or economically recoverable. **C859**

3.1.42 *waste characterization*—sampling, monitoring, and analysis activities to determine the extent and nature of a waste.

3.1.43 *waste form*—the waste materials and any encapsulating or stabilizing matrix/materials.

3.1.44 *weight percent solids*—the percent weight remaining after a material has been dried (see also *drying*) at 105°C, for a time long enough, to achieve constant weight, expressed as a percent of the initial weight of the material, for example, the initial weight of the material minus the amount of water or other volatiles lost upon drying at 105°C.

4. Significance and Use

4.1 This guide identifies methods to determine the physical and chemical characteristics of a variety of hazardous and/or radioactive wastes including heavy metal contaminated wastes. These wastes can be in the physical form of sludges (wet or dry), spent waste water filter aids, waste water filter cakes, incinerator ashes (wet or dry), incinerator blowdown (wet or dry), asbestos, resins, zeolites, soils, unset or unsatisfactory cementitious waste forms in need of remediation, lead paint wastes, radioactively or non-radioactively contaminated asbestos, geologic mill tailings (also known as byproduct materials) and other naturally occurring or accelerator produced radioactive materials (NORM and NARM), etc. and combinations of the above. This guide may not be applicable to piping, duct work, rubble, debris waste or wastes containing these components.

4.1.1 This guide identifies the physical and chemical characteristics useful for developing high temperature thermal treatment methodologies for a variety of hazardous and/or radioactive process wastes and soils including heavy metal contaminated wastes. The waste characteristics can be used to (*1*) choose and develop the thermal treatment methodology, (*2*) determine if waste pretreatment is needed, (*3*) aid in development of thermal treatment process control, (*4*) develop surrogate waste formulations, (*5*) perform treatability studies, (*6*) determine processing regions (envelopes) of acceptable waste form composition, and/or (*7*) perform pilot scale testing with

AVA Documents
Document Sharing Hub

Full document details: ASTM C1571-03(2012)

actual or surrogate waste, and/or (*8*) determine the composition and concentrations of off-gas species for regulatory compliance.

4.2 This guide identifies applicable test methods that can be used to measure the desired characteristics of the hazardous and/or radioactive wastes described in 4.1. The analyses discussed in this standard can be performed by a variety of techniques depending on equipment availability. For example, Gas Chromatograph Mass Spectrometry (GC/MS) can be used to measure the amount and type of off-gas species present. However, this standard assumes that such sophisticated equipment is unavailable for radioactive or hazardous waste service due to potential contamination of the equipment. The analyses recommended are, therefore, the simplest and least costly analyses that can be performed and still considered adequate. Not every characteristic given in this guide is necessary for every waste (see Fig. 1). Cation analysis is necessary for every waste in order to determine whether the final waste form will be a homogeneous glass, a glass-ceramic, or a slag (see Appendix X1).

4.2.1 Waste Analysis Method A is applicable when it is desired to know the amount and type of volatiles to be expected during thermal treatment and their compatibility with the thermal treatment and off-gas unit materials of construction and design capacity. These methods may be used to determine incinerator off-gas composition and concentrations.

4.2.2 Waste analysis Method A is applicable when it is necessary to know the amount of organics in the waste independently of the amount of other volatile constituents present for safety concerns. These methods may be used to determine incinerator off-gas composition and concentrations.

4.2.3 Waste analysis Method A is applicable when it is necessary to know if molten salt formation and accumulation in a thermal treatment unit in the presence of water vapor may be a safety concern.

4.2.4 Waste Analysis Methods B and C are applicable when it is desired to only know the amount of volatiles to be expected during thermal treatment, for example, when speciation of the volatiles and potential molten salt formation is not of concern. These methods may be used to determine the total concentration of incinerator off-gases.

4.3 Data from these tests may form part of the larger body of data that are necessary in the logical approach to development of high temperature treatment and/or pretreatment methodologies for a variety of hazardous and/or radioactive wastes as described in 4.1.

5. Summary of Waste Characteristics

5.1 Table 1 lists the waste characteristics that should be considered before a waste is processed in a high temperature thermal treatment apparatus. Table 1 describes the rationale for considering each characteristic.

5.2 Test Method A provides analysis of the weight percent solids, identification of the constituents and their concentrations that will vaporize during thermal treatment, identification of problematic anions that can attack materials of construction and/or form hazardous molten salt layers, and identification of the waste constituents and their concentrations that will be incorporated into the final glass, glass-ceramic, or slag.

5.3 Test Methods B and C can be used to determine total wt% LOH but not the LOH speciation. Test Methods B and C will also not provide organic analyses, anion analyses, and reduction/oxidation analyses.

6. Test Method A

NOTE 2—Note Method C should be used rather than Method B when the waste is very refractory.

6.1 Waste analysis Method A uses wastes that have been dried at 105 ± 2°C. The waste analysis strategy for Method A is given in Fig. 2. Method A provides analysis of the weight percent solids, identification of the constituents and their concentrations that will vaporize during thermal treatment, identification of problematic anions that can attack materials of construction and/or form hazardous molten salt layers, and identification of the waste constituents and their concentrations that will be incorporated into the final glass, glass-ceramic, or slag.

6.2 *Weight Percent Solids/Loss-on-Heating*—Weigh empty crucible. Weigh waste plus crucible before drying. Dry waste in crucible at 105°C until a constant weight is achieved to determine the weight percent (wt%) solids and Loss-On-Heating (wt% LOH) of water, if any, at this temperature. X-ray diffraction (XRD) analysis of the dried waste determines what phases are present. If hydroxide and/or carbonate species are identified in XRD analysis, additional Loss-on-Heating analyses at 300°C and 1000°C will be necessary (see 6.8 and 6.9). Calculate the wt% solids and wt% LOH at 105°C by the following:

$$\text{wt\% solids} = \{(W_3 - W_1)_{105°C}/(W_2 - W_1)_{rt}\}\cdot 100 \quad (1)$$

$$(\text{wt\% LOH})_{105°C} = \{(W_2 - W_1)_{rt} - (W_3 - W_1)_{105°C}\}/\{(W_2 - W_1)_{rt}\}\cdot 100$$

$$\text{wt\% solids} + (\text{wt\% LOH})_{105°C} = 100\,\%$$

where:

W_1 = weight of the crucible,
W_2 = weight of crucible and waste prior to drying, and
W_3 = weight of crucible and waste after drying at 105°C.

6.2.1 The weight % solids and the wt% $(LOH)_{105°C}$ should sum to 100 %.

6.3 *Cation Analyses*—Dissolution using fuming perchloric acid as used in the commercial glass industry (see Methods C169) is not recommended for radioactive samples as the fumes can cause radioactive species to become airborne and present inhalation and radionuclide uptake hazards to the user. Alternative dissolution methodologies are given in 6.3.1 – 6.3.5.

6.3.1 *HF/HN0$_3$ Microwave Dissolution (ASTM C1463)*—This methodology may be used to dissolve waste(s) but the user is cautioned that this dissolution methodology must be coupled with other dissolution methologies in order for a complete analysis to be achieved. The HF in this dissolution methodology compromises analysis of elements such as Si which form SiF_4 colloids which precipitate from the dissolution extract before Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES), Atomic Absorption (AA)

AVA Documents
Document Sharing Hub

Full document details: ASTM C1571-03(2012)

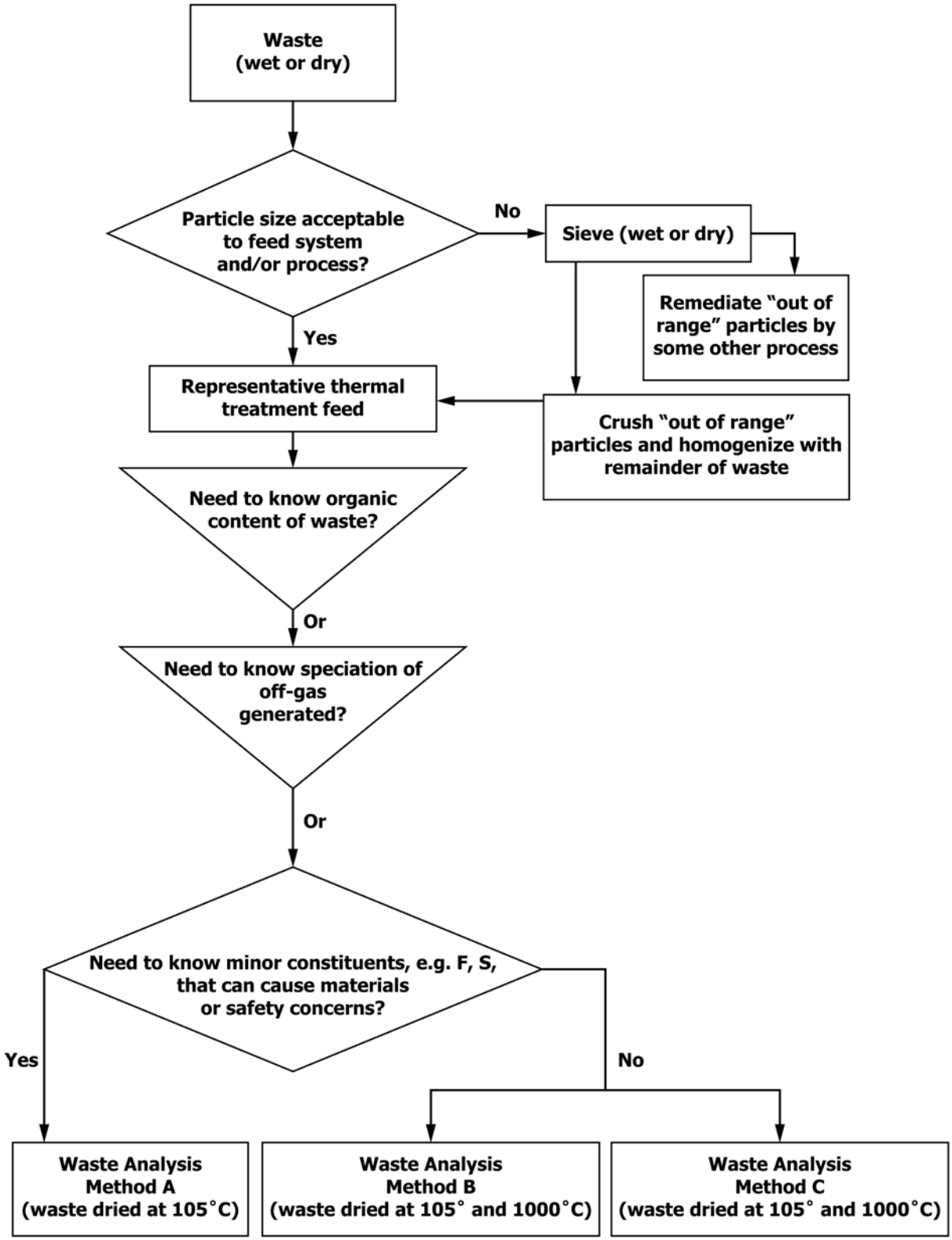

FIG. 1 Choice of Test Methods

Documents
Document Sharing Hub
Full document details: ASTM C1571-03(2012)