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Standard Guide for Conducting Bioconcentration Tests with Fishes and Saltwater Bivalve Mollusks¹

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1. Scope

1.1 This guide describes procedures for obtaining laboratory data concerning bioconcentration of a test material added to dilution water—but not to food—by freshwater and saltwater fishes and saltwater bivalve mollusks using the flow-through technique. These procedures also should be useful for conducting bioconcentration tests with other aquatic species, although modifications might be necessary.

1.2 Other modifications of these procedures might be justified by special needs or circumstances. Although using appropriate procedures is more important than following prescribed procedures, the results of tests conducted using unusual procedures are not likely to be comparable to those of many other tests. The comparison of results obtained using modified and unmodified versions of these procedures might provide useful information concerning new concepts and procedures for conducting bioconcentration tests.

1.3 These procedures are applicable to all chemicals that can be measured accurately at the necessary concentrations in water and in appropriate tissues. Bioconcentration tests are usually conducted on individual chemicals but can be conducted on mixtures if appropriate measurements can be made. Some techniques described in this guide were developed for tests on non-ionizable organic chemicals (see 11.1.2.1) and might not apply to ionizable or inorganic chemicals.

1.4 Results of bioconcentration tests should usually be reported in terms of apparent steady-state and projected steady-state bioconcentration factors (BCFs) and uptake and depuration rate constants. Results should be reported in terms of whole body for fishes and in terms of total soft tissue for bivalve mollusks. For fishes and scallops consumed by humans, some results should also be reported in terms of the edible portion, especially if ingestion of the test material by

humans is a major concern. For tests on organic and organo-metallic chemicals, the percent lipids of the tissue should be reported.

1.5 This guide is arranged as follows:

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1.6 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.7 *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.* Specific precautionary statements are given in Section 7. *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.*

1.8 *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](#)
- [D1193 Specification for Reagent Water](#)
- [D4447 Guide for Disposal of Laboratory Chemicals and Samples](#)
- [E729 Guide for Conducting Acute Toxicity Tests on Test Materials with Fishes, Macroinvertebrates, and Amphibians](#)
- [E943 Terminology Relating to Biological Effects and Environmental Fate](#)
- [E1023 Guide for Assessing the Hazard of a Material to Aquatic Organisms and Their Uses](#)
- [E1191 Guide for Conducting Life-Cycle Toxicity Tests with Saltwater Mysids](#)
- [E1192 Guide for Conducting Acute Toxicity Tests on Aqueous Ambient Samples and Effluents with Fishes, Macroinvertebrates, and Amphibians](#)
- [E1193 Guide for Conducting *Daphnia magna* Life-Cycle Toxicity Tests](#)
- [E1241 Guide for Conducting Early Life-Stage Toxicity Tests with Fishes](#)
- [E1295 Guide for Conducting Three-Brood, Renewal Toxicity Tests with *Ceriodaphnia dubia*](#)
- [E1688 Guide for Determination of the Bioaccumulation of Sediment-Associated Contaminants by Benthic Invertebrates](#)
- [E1706 Test Method for Measuring the Toxicity of Sediment-Associated Contaminants with Freshwater Invertebrates](#)
- [E1733 Guide for Use of Lighting in Laboratory Testing](#)
- [E1847 Practice for Statistical Analysis of Toxicity Tests](#)

- [Conducted Under ASTM Guidelines \(Withdrawn 2022\)³](#)
- [E2122 Guide for Conducting In-situ Field Bioassays With Caged Bivalves](#)
- [E2455 Guide for Conducting Laboratory Toxicity Tests with Freshwater Mussels](#)
- [SI 10 IEEE/ASTM SI 10 Standard for Use of the International System of Units \(SI\) \(the Modernized Metric System\)](#)

3. Terminology

3.1 Definitions:

3.1.1 The words “must,” “should,” “may,” “can,” and “might” have very specific meanings in this guide. “Must” is used to express an absolute requirement, that is, to state that the test ought to be designed to satisfy the specified condition, unless the purpose of the test requires a different design. “Must” is used only in connection with factors that relate directly to the acceptability of the test (see 13.1). “Should” is used to state that the specified condition is recommended and ought to be met if possible. Although violation of one “should” is rarely a serious matter, violation of several will often render the results questionable. Terms such as “is desirable” are used in connection with less important factors. “May” is used to mean “is (are) allowed to,” “can” is used to mean “is (are) able to,” and “might” is used to mean “could possibly.” Thus the classic distinction between “may” and “can” is preserved, and “might” is never used as a synonym for either “may” or “can.”

3.1.2 For definitions of other terms used in this guide, refer to Terminologies [D1129](#) and [E943](#) and Guide [E729](#). For an explanation of units and symbols, refer to Standard [SI 10](#).

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *apparent steady-state bioconcentration factor, n* —a BCF that does not change significantly over a period of two to four days at a uniform concentration (as defined in 11.10.3.2) of the test material in the solution containing the organism, that is, the BCF that exists when uptake and depuration are equal and bioconcentration (net accumulation) is zero for two to four days.

3.2.2 *bioaccumulation, n* —the net accumulation of a substance by an organism as a result of uptake from all environmental sources.

3.2.3 *bioconcentration, n* —the net accumulation of a substance by an aquatic organism as a result of uptake directly from aqueous solution.

3.2.4 *bioconcentration factor (BCF), n* —the quotient, at any time during the uptake phase of a bioconcentration test, of the concentration of a material in one or more tissues of an aquatic organism at that time, divided by the effective average exposure concentration at that time of the same material in the solution which contains the organism, in units of volume of solution per mass of organism. (BCFs are usually calculated so that the volume of solution, for example, 1 L, is about comparable to the mass of tissue, for example, 1 kg, and the BCF is reported without units.)

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 The last approved version of this historical standard is referenced on www.astm.org.