
Water quality — Determination of acute toxicity of marine or estuarine sediment to amphipods

Qualité de l'eau — Détermination de la toxicité aiguë des sédiments marins et estuariens vis-à-vis des amphipodes



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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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Introduction

This International Standard outlines procedures for conducting acute tests for sediment toxicity, using one or more amphipod species that are found primarily below the sediment surface in coastal marine and estuarine waters. The biological endpoint for the test is percent mortality at day 10.

Water quality — Determination of acute toxicity of marine or estuarine sediment to amphipods

1 Scope

This International Standard specifies a method for the determination of acute toxicity to amphipods exposed over a period of 10 d to

- a) samples of contaminated marine or estuarine sediment,
- b) chemical, industrial or municipal sludge, or other solid wastes that may combine with marine or estuarine sediments, or
- c) chemicals or preparations spiked into clean sediment.

2 Principle

Marine or estuarine amphipods which typically live below the sediment surface are exposed for 10 d to contaminated sediment or to sediment spiked with a test chemical. The endpoint for the test is percent mortality. The test is performed in 1-litre vessels with 175 ml of solid-phase sediment and overlying water. Salinity and temperature are dependent on the species of amphipod used in testing.

3 Test environment

3.1 Facilities

The test facility shall be well ventilated, isolated from physical disturbances and free from dust and fumes.

3.2 Lighting

All test vessels shall receive direct, overhead illumination that provides normal laboratory lighting (i.e. 500 lx to 1 000 lx) at the water surface. Illumination should be uniform and shall be continuous throughout the test period to inhibit the nocturnal migration of amphipods into the water column^[39].

4 Reagents and materials

4.1 Test organism

4.1.1 General

One of the marine or estuarine sediment-dwelling amphipod species listed in Annex B should be used as test organism for the method in this International Standard. The species identification should be conducted using taxonomic keys^[18] and confirmed by a qualified taxonomist familiar with identifying marine or estuarine amphipods.

4.1.2 Life stage and size

Amphipods of uniform age and size shall be used for testing and shall not be larger than the maximum allowable species size listed in Annex B. Do not use mature females bearing embryos, nor individuals longer than the maximum length (including antennae) identified in Annex B, as they might be senescent.

4.1.3 Source

All amphipods used in a test shall be derived from the same population and source. Test organisms can be either recently collected from an area in which contaminants are at or below background levels, or organisms can be cultured in a laboratory [11], [12], [48].

4.1.4 Collection, handling and transport

Depending on species and/or collection site conditions, collect amphipods using a benthic grab¹⁾, a small biological dredge or, in inter-tidal zones, a shovel. If a dredge is used, a short haul (< 10 m) minimizes damage to the animals^[39]. Collect at least one-third more individuals than are required for the test. Choose a collection site for which the presence of abundant organisms of the correct size and age has been demonstrated previously, or by pre-collection sieving of the sediment at the site^[31]. The organisms to be used as the test species should be confirmed taxonomically (e.g. references [4], [5], [32]).

Measure and record the salinity, temperature and dissolved oxygen content of water near the sediment at the collection site. Sieve sediment samples at the time of collection through a sieve of mesh 0,5 mm to 1,0 mm. The choice of sieve size depends on the size of the species to be collected and is important for determining the number of amphipods recovered. The sieve shall be made of non-toxic materials.

Use collection-site water for sieving sediment in the field, and to cover the sediment in the container(s) during specimen collection and transport. Discard detritus and predators recovered by sieving. Transport the collected amphipods either at a cool temperature, with only moist inert material such as seaweed in the transport container, or with overlying water and the amphipods returned to the sieved sediment in the transport container(s). Aerate overlying water during transport. Deliver an additional portion of the sieved sediment to the laboratory to use for holding amphipods and as control sediment. Reserve a portion of sediment for physical analysis (e.g. grain-size) and chemical analyses. Alternatively, collect and transport amphipods in bulk sediment without sieving at the field site. However, predatory organisms shall be removed by hand-picking from containers before shipment.

Efforts should be made to maintain site-water collection temperature and salinity during transport. Temperature in the transport container shall not rise above the optimum range for specific amphipod species, as outlined in Annex B. Overlying seawater shall be aerated during transit.

4.1.5 Holding and acclimation

If necessary, field-collected specimens may be re-sieved upon return to the laboratory (0,5 mm to 1,0 mm screen, depending on size of amphipods to be used in the test), if one wishes to assess their survival and condition, to confirm species, and to select and count numbers of amphipods of a size suitable for testing. However, it shall be noted that re-sieving of field-collected amphipods in the laboratory puts an additional stress on the organisms. Use seawater from the collection site, another field site or reconstituted seawater, as overlying water in the transport container, maintaining the original salinity (within ± 2 g/kg) and temperature (within ± 2 °C) of the collection-site seawater during transport.

In the laboratory, slowly agitate a sieve immersed in seawater to isolate organisms and move them using a wide-bore pipette, spoon, or fine net. Ensure that sieved organisms are submersed in seawater at all times. To minimize stress, handle organisms carefully and quickly. Amphipods that are dropped, injured, or in contact with dry surfaces shall be discarded. Only active and apparently healthy amphipods shall be transferred into the

1) Smith-McIntyre and van Veen are examples of suitable products available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of these products.