
**Paints and varnishes — Determination of
release rate of biocides from antifouling
paints —**

Part 5:

**Calculation of the tolylfluanid and
dichlofluanid release rate by
determination of the concentration of
dimethyltolylsulfamide (DMST) and
dimethylphenylsulfamide (DMSA) in the
extract**

*Peintures et vernis — Détermination du taux de lixiviation des biocides
contenus dans les peintures antisalissures —*

*Partie 5: Calcul du taux de lixiviation du tolylfluanide et du dichlofluanide
par détermination de la concentration du diméthyl-tolylsulfamide
(DMST) et du diméthyl-phénylsulfamide (DMSA) dans l'extrait*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15181-5 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

ISO 15181 consists of the following parts, under the general title *Paints and varnishes — Determination of release rate of biocides from antifouling paints*:

- *Part 1: General method for extraction of biocides*
- *Part 2: Determination of copper-ion concentration in the extract and calculation of the release rate*
- *Part 3: Calculation of the zinc ethylene-bis(dithiocarbamate) (zineb) release rate by determination of the concentration of ethylenethiourea in the extract*
- *Part 4: Determination of pyridine-triphenylborane (PTPB) concentration in the extract and calculation of the release rate*
- *Part 5: Calculation of the tolylfluanid and dichlofluanid release rate by determination of the concentration of dimethyltolylsulfamide (DMST) and dimethylphenylsulfamide (DMSA) in the extract*

The following part is under preparation:

- *Part 6: Determination of tralopyril release rate by quantification of its degradation product 3-bromo-5-(4-chlorophenyl)-4-cyano-1H-pyrrole-2-carboxylic acid (BCCPCA) in the extract*

Introduction

By using standard conditions of temperature, salinity and pH at low biocide concentrations in the surrounding artificial seawater, a repeatable value of the release rate under the specified laboratory conditions can be determined using the method given in this part of ISO 15181, which can be used for quality assurance and material selection purposes. The actual release rate of biocides from antifouling paints on ships' hulls into the environment will, however, depend on many factors, such as ship operating schedules, length of service, berthing conditions, paint condition, as well as temperature, salinity, pH, pollutants and biological community in a particular area.

The results of this test do not reflect environmental biocide release rates for antifouling products and are not suitable for direct use in the process of generating environmental-risk assessments, producing environmental-loading estimates or for establishing release rate limits for regulatory purposes. In comparison with copper and organotin release rates obtained either by direct or indirect measurements of the copper release rate from ships' hulls and from measurements made on panels exposed in harbours, all available data indicate that the results obtained using this generic test method significantly overestimate the release rates of biocides under in-service conditions. Published results demonstrate that the results of this test method are generally higher by a factor of about 10 or more for several commercial antifouling coatings than direct *in situ* measurements of copper and organotin release rates from in-service ship hulls [1, 2]. A similar relationship is expected to be found for other biocides. Realistic estimates of the biocide release rate from a ship's hull under in-service conditions can only be obtained from this test method if this difference is taken into account.

Where the results of this test method are used in the process of generating environmental-risk assessments, producing environmental-loading estimates or for regulatory purposes, it is most strongly recommended that the relationship between laboratory release rates and actual environmental inputs be taken into account to allow a more accurate estimate of the biocide release rate from antifouling coatings under real-life conditions to be obtained. This can be accomplished through the application of appropriate correction factors [2].

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1 Scope

This part of ISO 15181 specifies the apparatus and analytical method for determining the amount of tolylfluanid and dichlofluanid that has been released from an antifouling paint into artificial seawater in accordance with the procedure given in ISO 15181-1.

Tolyfluanid and dichlofluanid are unstable in the marine environment and degrade to form dimethyltolylsulfamide (DMST) and dimethylphenylsulfamide (DMSA), respectively. This part of ISO 15181 specifies a method for converting the released species into these degradation products, quantifying their concentration in the treated artificial seawater samples, and gives the final calculation for the release rate of tolylfluanid and dichlofluanid under the specified laboratory conditions.

This part of ISO 15181 is designed to allow the concurrent determination of tolylfluanid, dichlofluanid and other biocides that can be released by a given antifouling paint (for example, copper) through the analysis of separate sub-samples of an artificial seawater extract generated in accordance with ISO 15181-1.

When used in conjunction with ISO 15181-1, the practical limits for quantifying release rates by this method are from $1,3 \mu\text{g}\cdot\text{cm}^{-2}\cdot\text{d}^{-1}$ to $500 \mu\text{g}\cdot\text{cm}^{-2}\cdot\text{d}^{-1}$. The quantitation of release rates lower than this range will require the use of an analytical method with a lower limit of quantitation for tolylfluanid, dichlofluanid, or both (as appropriate) in artificial seawater than that specified in Clause 3 and in 5.1.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 15181-1:2007, *Paints and varnishes — Determination of release rate of biocides from antifouling paints — Part 1: General method for extraction of biocides*

ASTM D 6442-06, *Standard Test Method for Determination of Copper Release Rate from Antifouling Coatings in Substitute Ocean Water*