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Quantitative determination of antibacterial activity of ceramic tile surfaces — Test methods —

Part 2: Ceramic tile surfaces with incorporated photocatalytic antibacterial agents

Détermination quantitative de l'activité antibactérienne des surfaces des carreaux céramiques — Méthodes d'essai —

Partie 2: Carreaux céramiques incorporant des agents antibactériens photocatalytiques en surface

Reference number
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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 189, *Ceramic tile*.

A list of all parts in the ISO 17721 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Quantitative determination of antibacterial activity of ceramic tile surfaces — Test methods —

Part 2:
Ceramic tile surfaces with incorporated photocatalytic antibacterial agents

1 Scope

This document specifies test methods for evaluating the antibacterial activity of glazed and unglazed ceramic tile surfaces with incorporated photocatalytic antibacterial agents.

Secondary effects on ceramic tile surfaces due to photocatalytic antibacterial treatments, such as changes in chemical resistance, stain resistance or small colour differences, are not covered by this document. For chemical resistance refer to ISO 10545-13, for stain resistance refer to ISO 10545-14 and for colour differences refer to ISO 10545-16.

Other types of performance of photocatalytic ceramics, i.e. decomposition of water contaminants, self-cleaning, antifogging and air purification, are not covered by this document. It is also not intended to be used to evaluate ceramic surfaces that have been treated with topical disinfectants or agents that can offer residual activity for limited periods.

Any results obtained with this document will always refer to this document and the conditions used. Results obtained with this document indicate antibacterial activity under the specified experimental conditions used herein, and do not reflect activity under other circumstances where a variety of factors, such as temperature, humidity, different bacterial species, nutrient conditions, etc., are considered.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 17721-1, *Quantitative determination of antibacterial activity of ceramic tile surfaces – Test methods – Part1: Ceramic tile surfaces with incorporated antibacterial agents*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17721-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
photocatalyst
substance that carries out many functions based on oxidization and reduction reactions under ultraviolet (UV) irradiation, including decomposition and removal of air and water contaminants, deodorization, and antibacterial, self-cleaning and antifogging actions

4 Materials

WARNING — Handling and manipulation of microorganisms which are potentially hazardous requires a high degree of technical competence and may be subject to current national legislation and regulations. Only personnel trained in microbiological techniques should carry out such tests. Appropriate practices for disinfection, sterilization and laboratory hygiene must be strictly observed.

4.1 Bacterial strains

Bacteria used for the tests are:

a) *Escherichia coli*;

b) *Staphylococcus aureus*.

The bacterial strains to be used in the test are listed in Table 1 and are stored by entities that are registered under the World Federation for Culture Collections or of the Japan Society for Culture Collections. Other bacterial species may be tested with this test method, details of the species used, culture conditions and testing process shall be described in detail in the test report.

Transfer of cultures should be performed aseptically in safety cabinets. Inoculate each strain onto a nutrient agar medium slant using a sterile inoculation loop; incubate for 18 h - 24 h at 37 °C ± 1 °C, and then store at 5 °C – 10 °C. Subculture the strains by repeating the process within 30 d. The maximum number of subcultures from the original strain from the culture collection is 10. Discard slant cultures appropriately after 30 d.

NOTE 1 In the case of bacteria stored at -80 °C and lyophilized cultures, the maximum number of subcultures from the original strain is 10.

NOTE 2 If necessary, additional tests with other bacterial strains can be performed.

Table 1 — Bacterial strains and culture collections

Bacteria	Culture collections
E. coli	ATCC 8739, DSM 1576, NBRC 3972, CIP 53.126, NCIB 8545
S. aureus	ATCC 6538P, DSM 346, NBRC 12732, CIP 53.156, NCIB 8625

4.2 Culture media and solutions

Any water used shall be distilled or deionized and have a conductivity of <1 µS/cm. All reagents shall be of analytical grade and/or of a grade appropriate for microbiological purposes.

4.2.1 Non-ionic surfactant

The non-ionic surfactant shall be polyoxyethylene sorbitan monooleate (polysorbate 80).

4.2.2 Nutrient broth

For 1 000 ml of purified water, take 3,0 g of meat extract, 10,0 g of peptone and 5,0 g of sodium chloride, put them in a flask and dissolve them thoroughly. When the contents are thoroughly dissolved, use a solution of sodium hydroxide or hydrochloric acid to bring the pH to (7,0 ± 0,1) at 25 °C. Sterilize in an autoclave at 121 °C ± 2 °C for at least 15 min. After preparation, if nutrient broth is not used immediately, store it at 5 °C to 10 °C. Storage for long periods should be avoided. Other suitable media such as tryptic soy agar (TSA) and tryptic soy broth (TSB) can also be used for the growth and quantification steps.