
**Corrosion of metals and alloys —
Vocabulary**

Corrosion des métaux et alliages — Vocabulaire

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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).

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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 156, *Corrosion of metals and alloys*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 262, *Metallic and other inorganic coatings, including for corrosion protection and corrosion testing of metals and alloys*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fifth edition cancels and replaces the fourth edition (ISO 8044:2015), which has been technically revised to include additional terms and definitions.

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.

Introduction

The definitions in this document have been drawn up with the objective of achieving a proper balance between precision and simplicity. The main objective of this document is to provide definitions that can be understood to have the same meaning by all concerned. Some corrosion terms in present use have developed through common usage and are not always logical. It has not, therefore, been possible to define certain terms in the form they are used in some countries. Because of the occasional conflicts between tradition and logic, some definitions inevitably represent a compromise.

An example of this kind of conflict is the term “corrosion”. This has been used to mean the process, results of the process and damage caused by the process. In this document, corrosion is understood to mean the process. Any detectable result of corrosion in any part of a corrosion system is termed “corrosion effect”. The term “corrosion damage” covers any impairment of the function of the technical system of which the metal and the environment form a part. Consequently, the term “corrosion protection” implies that the important thing is to avoid corrosion damage rather than to prevent corrosion, which in many cases is impossible and sometimes not necessary.

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Corrosion of metals and alloys — Vocabulary

1 Scope

This document defines terms relating to corrosion that are widely used in modern science and technology. In addition, some definitions are supplemented with short explanations.

NOTE 1 Throughout the document, IUPAC rules for electrode potential signs are applied. The term “metal” is also used to include alloys and other metallic materials.

NOTE 2 Terms and definitions related to the inorganic surface treatment of metals are given in ISO 2080.

2 Normative references

There are no normative references in this document.

3 Terms related to corrosion in general

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 <http://www.electropedia.org/>

3.1 corrosion

physicochemical interaction between a metallic material and its environment that results in changes in the properties of the metal, and that may lead to significant impairment of the function of the metal, the environment or the technical system, of which these form a part

Note 1 to entry: This interaction is often of an electrochemical nature.

3.2 corrosive agent

substance that will initiate or promote *corrosion* (3.1) when in contact with a given metal

3.3 corrosive environment

environment that contains one or more *corrosive agents* (3.2)

3.4 corrosion system

system consisting of one or more metals and those parts of the environment that influence *corrosion* (3.1)

Note 1 to entry: Parts of the environment may be, for example, coatings, surface layers or additional *electrodes* (7.1.2).

3.5 corrosion effect

change in any part of the *corrosion system* (3.4) caused by *corrosion* (3.1)

3.6 corrosion damage

corrosion effect (3.5) that causes impairment of the function of the metal, the environment or the technical system, of which these form a part

**3.7
corrosion failure**

corrosion damage (3.6) characterized by the total loss of function of the technical system

**3.8
corrosion product**

substance formed as a result of *corrosion* (3.1)

**3.9
scale**

solid layer of *corrosion products* (3.8) formed on a metal at high temperature

Note 1 to entry: The term “scale” is also used in some countries for deposits from supersaturated water.

**3.10
rust**

visible *corrosion products* (3.8) consisting mainly of hydrated iron oxides

**3.11
corrosion depth**

distance between a point on the surface of a metal affected by *corrosion* (3.1) and the original surface of the metal

**3.12
corrosion rate**

corrosion effect (3.5) on a metal per unit time

Note 1 to entry: The unit used to express the corrosion rate depends on the technical system and on the type of corrosion effect. Thus, corrosion rate is typically expressed as an increase in *corrosion depth* (3.11) per unit time, or the mass of metal turned into *corrosion products* (3.8) per area of surface and per unit time, etc. The corrosion effect may vary with time and may not be the same at all points of the corroding surface. Therefore, reports of corrosion rates are typically accompanied by information on the type, time dependency and location of the corrosion effect.

**3.13
corrosion resistance**

ability of a metal to maintain *serviceability* (3.16) in a given *corrosion system* (3.4)

**3.14
corrosivity**

ability of an environment to cause *corrosion* (3.1) of a metal in a given *corrosion system* (3.4)

**3.15
corrosion likelihood**

qualitative and/or quantitative expression of the expected *corrosion effects* (3.5) in a defined *corrosion system* (3.4)

**3.16
serviceability**

<corrosion> ability of a *corrosion system* (3.4) to perform its specified functions without impairment due to *corrosion* (3.1)

**3.17
durability**

<corrosion> ability of a *corrosion system* (3.4) to maintain *serviceability* (3.16) over a specified time when the specified requirements for use and maintenance have been fulfilled

**3.18
service life**

<corrosion> time during which a *corrosion system* (3.4) meets the requirements for *serviceability* (3.16)

3.19**critical humidity**

value of the relative humidity of an atmosphere above which there is a sharp increase in the *corrosion rate* (3.12) of a given metal

3.20**corrosion attack**

corrosion effect (3.5) that is detrimental but has not progressed to the point of impairment of the function of the metal, the environment or the technical system, of which these form a part

3.21**pickling**

removal of oxides or other compounds from a metal surface by chemical or electrochemical action

3.22**pitting resistance equivalent number****PREN**

indication of the resistance of stainless steels and nickel-based alloys to pitting in the presence of chloride-containing water

Note 1 to entry: An example formula for PREN is given by

$$\text{PREN} = \% \text{Cr} + 3,3 [(\% \text{Mo}) + 0,5 (\% \text{W})] + 16 (\% \text{N})$$

Note 2 to entry: In general, the higher the PREN the higher the resistance to *pitting corrosion* (4.15).

3.23**trap**

micro structural site at which the residence time for a hydrogen atom is long compared to the residence time in an interstitial lattice site

3.24**time of wetness**

period when a metallic surface is covered by adsorptive and/or liquid films of *electrolyte* (7.1.1) to be capable of causing *atmospheric corrosion* (4.4)

3.25**threshold stress**

<stress corrosion cracking> tensile stress above which stress corrosion cracks initiate and grow for specified test conditions

3.26**threshold stress intensity factor for stress corrosion cracking** K_{ISCC}

stress intensity factor above which stress corrosion crack propagation is sustained

Note 1 to entry: The threshold stress intensity factor is a concept of linear elastic fracture mechanics (LEFM) and is applicable when the plastic zone size is large compared with the microstructure, the crack is sufficiently long, and a high constraint to plastic deformation prevails, i.e. under plane strain predominant conditions. For growing stress corrosion cracks, LEFM is not necessarily applicable in all detail but is adopted as a pragmatic tool that is commonly used.

Note 2 to entry: Stress corrosion cracks may initiate at a surface or a surface defect and grow in the "small crack" regime at stress intensity factor levels below the apparent threshold stress intensity factor. Therefore, LEFM is not applicable in the "small crack" regime.

4 Terms related to types of corrosion

4.1 electrochemical corrosion

corrosion (3.1) involving at least one *anodic reaction* (7.1.9) and one *cathodic reaction* (7.1.6)

4.2 chemical corrosion

corrosion (3.1) not involving an electrochemical reaction

4.3 gaseous corrosion

corrosion (3.1) with dry gas as the *corrosive environment* (3.3) and without any liquid phase on the surface of the metal

4.4 atmospheric corrosion

corrosion (3.1) with the earth's atmosphere at ambient temperature as the *corrosive environment* (3.3)

4.5 marine corrosion

corrosion (3.1) with sea water as the main agent of the *corrosive environment* (3.3)

Note 1 to entry: This definition includes both immersed and splash zone conditions.

4.6 underground corrosion

corrosion (3.1) of buried metals, soil being the *corrosive environment* (3.3)

Note 1 to entry: The term soil includes not only the naturally occurring material but also any other material, such as ballast and backfill, used to cover a structure.

4.7 bacterial corrosion

microbiologically influenced corrosion (4.37) due to the action of bacteria

4.8 general corrosion

corrosion (3.1) proceeding over the whole surface of the metal exposed to the *corrosive environment* (3.3)

4.9 uniform corrosion

general corrosion (4.8) proceeding at almost the same rate over the whole surface

4.10 localized corrosion

corrosion (3.1) preferentially concentrated on discrete sites of the metal surface exposed to the *corrosive environment* (3.3)

Note 1 to entry: Localized corrosion can result in, for example, pits, cracks or grooves.

4.11 galvanic corrosion

corrosion (3.1) due to the action of a *corrosion cell* (7.1.13)

Note 1 to entry: The term has often been restricted to the action of bimetallic corrosion cells, i.e. to *bimetallic corrosion* (4.12).

4.12 bimetallic corrosion

DEPRECATED: contact corrosion

galvanic corrosion (4.11) where the *electrodes* (7.1.2) are formed by dissimilar metals

4.13**impressed current corrosion**

electrochemical corrosion (4.1) due to the action of an external source of electric current

4.14**stray-current corrosion**

impressed current corrosion (4.13) caused by current flowing through paths other than the intended circuits

4.15**pitting corrosion**

localized corrosion (4.10) resulting in pits, i.e. cavities extending from the surface into the metal

4.16**crevice corrosion**

localized corrosion (4.10) associated with, and taking place in or immediately around, a narrow aperture or clearance formed between the metal surface and another surface (metallic or non-metallic)

4.17**deposit corrosion**

localized corrosion (4.10) associated with, and taking place under or immediately around, a deposit of *corrosion products* (3.8) or other substance

4.18**water-line corrosion**

corrosion (3.1) along, and as a consequence of the presence of, a gas/liquid boundary

4.19**selective corrosion dealloying**

corrosion (3.1) of an alloy whereby the components react in proportions that differ from their proportions in the alloy

4.20**dezincification of brass**

selective corrosion (4.19) of brass resulting in the preferential removal of zinc

4.21**graphitic corrosion**

selective corrosion (4.19) of grey cast iron resulting in the partial removal of metallic constituents and leaving graphite

4.22**intergranular corrosion**

corrosion (3.1) in or adjacent to the grain boundaries of a metal

4.23**weld corrosion**

corrosion (3.1) associated with the presence of a welded joint and taking place in the weld or its vicinity

4.24**knife-line corrosion**

corrosion (3.1) resulting in a narrow slit in or adjacent to the filler/parent boundary of a welded or brazed joint

4.25**erosion corrosion**

process involving conjoint *corrosion* (3.1) and erosion

Note 1 to entry: Erosion corrosion can occur in, for example, pipes with high fluid flow velocity and pumps and pipe lines carrying fluid containing abrasive particles in suspension or entrained in a gas flow.