

# Corrosion Glossary

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## absorption

A process in which Quid molecules are taken up by a liquid or solid and distributed throughout the body of that liquid or solid. Compare with *adsorption*.

## accelerated corrosion test

Method designed to approximate, in a short time, the deteriorating effect under normal long-term service conditions.

## acid

A chemical substance that yields hydrogen ions ( $H^+$ ) when dissolved in water. Compare with *base*.

## acid embrittlement

A form of *hydrogen embrittlement* that may be induced in some metals by acid.

## acid rain

Atmospheric precipitation with a pH below 3.6 to 5.7. Burning of fossil fuels for heat and power is the major factor in the generation of oxides of nitrogen and sulfur, which are converted into nitric and sulfuric acids washed down in the rain. See also *atmospheric corrosion*.

## acicular ferrite

A highly substructured non-equiaxed *ferrite* formed upon continuous cooling by a mixed diffusion and shear mode of transformation that begins at a temperature slightly higher than the transformation temperature range for upper bainite. It is distinguished from *bainite* in that it has a limited amount of carbon available thus, there is only a small amount of carbide present.

## acrylic

Resin polymerized from acrylic acid, methacrylic acid, eaters of these acids, or acrylonitrile.

## activation

The changing of a passive surface of a metal to a chemically active state. Contrast with *passivation*.

## active

A state in which a metal tends to corrode; referring to the negative direction of electrode potential (opposite of passive or noble).

## active Metal

A metal ready to corrode, or being corroded

## active potential

The *potential* of a corroding material.

## activity

A measure of the *chemical potential* of a substance, where chemical potential is not equal to concentration, that allows mathematical relations equivalent to those for ideal systems to be used to correlate changes in an

## ammeter

An instrument for measuring the magnitude of electric current flow.

## amorphous solid

A rigid material whose structure lacks crystalline periodicity; that is, the pattern of its constituent atoms or molecules does not repeat periodically in three dimensions. See also *metallic glass*.

## amphoteric

A term applied to oxides and hydroxides which can act basic toward strong acids and acidic toward strong alkalis. Substances which can dissociate electrolytically to produce hydrogen or hydroxyl ions according to conditions.

## anchorite

A zinc-iron phosphate coating for iron and steel.

## anaerobic

In the absence of air or unreacted or free oxygen.

## anion

An ion or radical which is attracted to the anode because of the negative charge. See also *cation* and *ion*.

## annealing

A generic term denoting a treatment. consisting of heating to and holding at a suitable temperature, followed by cooling at a suitable rate, used primarily to soften metallic materials, but also to simultaneously produce desired changes in other properties or in microstructure. The purpose of such changes may be. but is not confined to. improvement of machinability, facilitation of cold work, improvement of mechanical or electrical properties, and/or increase in stability of dimensions. When the term is used by itself, full annealing is implied. When applied only for the relief of stress, the process is properly called stress relieving or stress-relief annealing.

## anode

The electrode at which oxidation or corrosion of some component occurs (opposite of cathode). Electrons flow away from the anode in the external circuit.

## anode corrosion

The dissolution of a metal acting as an *anode*.

## anode corrosion efficiency

Ratio of actual to theoretical corrosion based on the total current flow calculated by *Faraday's law* from the quantity of electricity that has passed.

## anode effect

The effect produced by polarization

	experimentally measured quantity with changes in chemical potential.		
<b>activity (ion)</b>	The ion concentration corrected for deviations from ideal behavior. Concentration multiplied by activity coefficient. activity coefficient. A characteristic of a quantity expressing the deviation of a solution from ideal thermodynamic behavior; often used in connection with electrolytes.		of the <i>anode</i> in electrolysis. It is characterized by a sudden increase in voltage and a corresponding decrease in amperage due to the anode becoming virtually separated from the electrolyte by a gas film.
<b>addition agent</b>	A substance added to a solution for the purpose of altering or controlling a process. Examples include wetting agents in acid pickles, brighteners or antipitting agents in plating solutions, and inhibitors.	<b>anode efficiency</b>	Current efficiency of the <i>anode</i> ..
<b>additive</b>	A substance added in a small amount, usually to a fluid, for a special purpose, such as to reduce friction, corrosion, etc.	<b>anode film</b>	(1) The portion of solution in immediate contact with the <i>anode</i> , especially if the concentration gradient is steep. (2) The outer layer of the anode itself.
<b>adsorption</b>	The surface retention of solid, liquid, or gas molecules, atoms, or ions by a solid or liquid. Compare with <i>absorption</i> ..	<b>anodic cleaning</b>	Electrolytic cleaning in which the work is the anode. Also called reverse-current cleaning.
<b>aeration</b>	(1) Exposing to the action of air. (2) Causing air to bubble through. (3) Introducing air into a solution by spraying, stirring, or a similar method. (4) Supplying or infusing with air, as in sand or soil.	<b>anodic coating</b>	A film on a metal surface resulting from an electrolytic treatment at the <i>anode</i> ..
<b>aeration Cell</b>	An oxygen concentration cell; an electrolytic cell resulting from differences in dissolved oxygen at two points. Also see <i>differential aeration cell</i> ..	<b>anodic inhibitor</b>	A chemical substance or combination of substances that prevent or reduce the rate of the anodic or oxidation reaction by a physical, physico-chemical or chemical action.
<b>age hardening</b>	Hardening by <i>aging</i> , usually after rapid cooling or cold working.	<b>anodic polarization</b>	The change in the initial anode potential resulting from current flow effects at or near the anode surface. Potential becomes more noble (more positive) because of anodic polarization.
<b>aging</b>	A change in the properties of certain metals and alloys that occurs at ambient or moderately elevated temperatures after hot working or a heat treatment (quench aging in ferrous alloys, natural or artificial aging in ferrous and nonferrous alloys) or after a cold-working operation (strain aging). The change in properties is often, but not always, due to a phase change (precipitation), but never involves a change in chemical composition of the metal or alloy. See also <i>age hardening, artificial aging, natural aging, averaging, precipitation hardening, precipitation heat treatment, quench aging, and strain aging</i> ..	<b>anodic potential</b>	An appreciable reduction in corrosion by making a metal an anode and maintaining this highly polarized condition with very little current flow.
<b>alclad</b>	Composite wrought product comprised of an aluminum alloy core having on one or both surfaces a metallurgically bonded aluminum or aluminum alloy coating that is anodic to the core and thus electrochemically protects the core against corrosion.	<b>anodic protection</b>	A technique to reduce corrosion of a metal surface under some conditions by passing sufficient to it to cause its electrode potential to enter and remain in the passive region; imposing an external electrical potential to protect a metal from corrosive attack. (Applicable only to metals that show active-passive behavior.) Contrast with <i>cathodic protection</i> ..
<b>alkali metal</b>	A metal in group IA of the periodic	<b>anodic reaction</b>	Electrode reaction equivalent to a transfer of positive charge from the electronic to the ionic conductor. An anodic reaction is an oxidation process. An example common in corrosion is: $Me \sim Me^{n+} + ne$ ..
		<b>anodizing</b>	Forming a <i>conversion coating</i> on a metal surface by anodic oxidation; most frequently applied to aluminum.
		<b>anolyte</b>	The electrolyte adjacent to the <i>anode</i> in an <i>electrolytic cell</i> . usually made of noncorroding material.
		<b>anti-fouling</b>	Intended to prevent fouling of under-water structures, such as the bottoms of ships; refers to the prevention of marine organism's

	system namely, lithium, sodium, potassium, rubidium, cesium, and francium. They form strongly alkaline hydroxides, hence the name.		attachment or growth on a submerged metal surface, generally through chemical toxicity caused by the composition of the metal or coating layer.
<b>alkaline</b>	(1) Having properties of an alkali. (2) Having a pH greater than 7.	<b>antipitting agent</b>	An addition agent for electroplating solutions to prevent the formation of pits or large pores in the electrodeposit.
<b>alkaline cleaner</b>	A material blended from alkali hydroxides and such alkaline salts as borates, carbonates, phosphates, or silicates. The cleaning action may be enhanced by the addition of surface-active agents and special solvents.	<b>aqueous</b>	Pertaining to water; an aqueous solution is made by using water as a solvent.
<b>alkyd</b>	Resin used in coatings. Reaction products of polyhydric alcohols and polybasic acids.	<b>artificial aging</b>	Aging above room temperature. See also <i>aging</i> . Compare with <i>natural aging</i> .
<b>alkylation</b>	(1) A chemical process in which an alkyl radical is introduced into an organic compound by substitution or addition. (2) A refinery process for chemically combining isoparaffin with olefin hydrocarbons.	<b>atmospheric corrosion</b>	The gradual degradation or alteration of a material by contact with substances present in the atmosphere, such as oxygen, carbon dioxide, water vapor, and sulfur and chlorine compounds.
<b>alligatoring</b>	(1) Pronounced wide cracking over the entire surface of a coating having the appearance of alligator hide. (2) The longitudinal splitting of flat slabs in a plane parallel to the rolled surface. Also called fish-mouthing.	<b>austenitic</b>	The name given to the face-centered cubic crystal structure (FCC) of ferrous metals. Ordinary iron and steel has this structure at elevated temperatures; also certain stainless steels (300 series) have this structure at room temperature.
<b>alloy plating</b>	The codeposition of two or more metallic elements.	<b>austenite</b>	A solid solution of one or more elements in face-centered cubic iron. Unless otherwise designated (such as nickel austenite), the solute is generally assumed to be carbon.
<b>alpha ferrite</b>	See <i>ferrite</i> .	<b>austenitizing</b>	Forming austenite by heating a ferrous alloy into the transformation range (partial austenitizing) or above the transformation range (complete austenitizing). When used without qualification, the term implies complete austenitizing.
<b>alpha iron</b>	The body-centered cubic form of pure iron, stable below 910 °C (1670 °F).	<b>auxiliary anode</b>	In electroplating, a supplementary <i>anode</i> positioned so as to raise the current density on a certain area of the <i>cathode</i> and thus obtain better distribution of plating.
<b>alternate-immersion test</b>	A corrosion test in which the specimens are intermittently exposed to a liquid medium at definite time intervals.	<b>auxiliary electrode</b>	An electrode commonly used in polarization studies to pass current to or from a test electrode.
<b>aluminizing</b>	Forming of an aluminum or aluminum alloy coating on a metal by hot dipping, hot spraying, or diffusion.		
<b>amalgam</b>	An alloy of mercury with one or more other metals.		