

Corrosion Glossary

Tafel Line, Tafel Slope, Tafel Diagram

An electrode when polarized frequently yields a current potential relationship over a region which can be approximated by:

$$h = \pm B \log (i/i_0)$$

where h = change in open circuit potential, i = the current density, B and i_0 = constants. B is known as the Tafel Slope.

If this behavior is observed a plot of the semilogarithmic components is known as the Tafel line and the diagram is called the Tafel diagram.

tarnish

Surface discoloration of a metal caused by formation of a thin film of corrosion product.

temper

(1) In heat treatment, to reheat hardened steel or hardened cast iron to some temperature below the eutectoid temperature for the purpose of decreasing hardness and increasing toughness. The process is also sometimes applied to normalized steel. (2) In tool steels, temper is sometimes inadvisably used to denote carbon content. (3) In nonferrous alloys and in some ferrous alloys (steels that cannot be hardened by heat treatment), the hardness and strength produced by mechanical or thermal treatment, or both, and characterized by a certain structure, mechanical properties. Or reduction of area during cold working.

temper color

A thin, tightly adhering oxide skin (only a few molecules thick) that forms when steel is tempered at a low temperature, or for a short time, in air or a mildly oxidizing atmosphere. The color, which ranges from straw to blue depending on the thickness of the oxide skin, varies with both tempering time and temperature.

tempered martensite embrittlement

Embrittlement of ultrahigh-strength steels caused by tempering in the temperature range of 205 to 400 °C (400 to 750 °F); also called 350 °C or 500 °F embrittlement. Tempered martensite embrittlement is thought to result from the combined effects of cementite precipitation on prior-austenite grain boundaries or interlath boundaries and the segregation of impurities at prior-austenite grain boundaries.

temper embrittlement

Embrittlement of alloy steels caused by holding within or cooling slowly through a temperature range just

thermocouple

A device for measuring temperatures, consisting of lengths of two dissimilar metals or alloys that are electrically joined at one end and connected to a voltage-measuring instrument at the other end. When one junction is hotter than the other, a *thermal electromotive force* is produced that is roughly proportional to the difference in temperature between the hot and cold junctions.

thermogalvanic corrosion

Corrosion resulting from an *electrochemical cell* caused by a thermal gradient.

threshold stress

Threshold stress for *stress-corrosion-cracking*. The critical gross section stress at the onset of stress-corrosion cracking under specified conditions.

throwing power

(1) The relationship between the current density at a point on a surface and its distance from the counter electrode. The greater the ratio of the surface resistivity shown by the electrode reaction to the volume resistivity of the electrolyte, the better is the throwing power of the process. (2) The ability of a plating solution to produce a uniform metal distribution on an irregularly shaped cathode. Compare with *covering power*.

tinning

Coating metal with a very thin layer of molten solder or brazing filler metal.

torsion

A twisting deformation of a solid body about an axis in which lines that were initially parallel to the axis become helices.

torsional stress

The shear stress on a transverse cross section resulting from u twisting action.

total carbon

The sum of the *free carbon* and *combined carbon* (including carbon in solution) in a ferrous alloy.

toughness

The ability of a metal to absorb energy and deform plastically before fracturing.

transcrystalline

See *transgranular*.

transcrystalline cracking

See *transgranular cracking*.

transference

The movement of ions through the *electrolyte* associated with the passage of the electric current. Also

- below the transformation range. Embrittlement is the result of the segregation at grain boundaries of impurities such as arsenic, antimony, phosphorus, and tin; it is usually manifested as an upward shift in ductile-to-brittle transition temperature. Temper embrittlement can be reversed by retempering above the critical temperature range, then cooling rapidly.
- tensile strength**
In tensile testing, the ratio of maximum load to original cross-sectional area. Also called ultimate tensile strength.
- tensile stress**
A stress that causes two parts of an elastic body, on either side of a typical stress plane, to pull apart. Contrast with *compressive stress*.
- tension**
The force or load that produces elongation.
- terne**
An alloy of lead containing 3 to 15% Sn, used as a *hot dip coating* for steel sheet or plate. Terne coatings, which are smooth and dull in appearance, give the steel better corrosion resistance and enhance its ability to be formed, soldered, or painted.
- thermoelectric force.**
The *electromotive force* generated in a circuit containing two dissimilar metals when one junction is at a temperature different from that of the other. see also *thermocouple*.
- thermal embrittlement**
Intergranular fracture of maraging steels with decreased toughness resulting from improper processing after hot working. Thermal embrittlement occurs upon heating above 1095 °C (2000 °F) and then slow cooling through the temperature range of 815 to 980 °C (1300 to 1800 °F), and has been attributed to precipitation of titanium carbides and titanium carbonitrides at austenite grain boundaries during cooling through the critical temperature range.
- thermally induced embrittlement**
See *embrittlement*.
- thermal spraying**
A group of coating or welding processes in which finely divided metallic or nonmetallic materials are deposited in a molten or semimolten condition to form a coating. The coating material may be in the form of powder, ceramic rod, wire, or molten materials. See also *flame spraying* and *plasma spraying*.
- called transport or migration.
- transgranular**
Through or across crystals or grains. Also called intracrystalline or transcrystalline.
- transgranular cracking**
Cracking or fracturing that occurs through or across a crystal or grain. Also called transcrystalline cracking. Contrast with *intergranular cracking*.
- transgranular fracture**
Fracture through or across the crystals or grains of a metal. Also called transcrystalline fracture or intracrystalline fracture. Contrast with *intergranular fracture*.
- transition metal**
A metal in which the available electron energy levels are occupied in such a way that the d-band contains less than its maximum number of ten electrons per atom, for example, iron, cobalt, nickel, and tungsten. The distinctive properties of the transition metals result from the incompletely filled d-levels.
- transition temperature**
(1) An arbitrarily defined temperature that lies within the temperature range in which metal fracture characteristics (as usually determined by tests of notched specimens) change rapidly, such as from primarily fibrous (shear) to primarily crystalline (cleavage) fracture. (2) Sometimes used to denote an arbitrarily defined temperature within a range in which the ductility changes rapidly with temperature.
- transpassive region**
The region of an *anodic polarization* curve, noble to and; above the passive *potential* range, in which there is a significant increase in current density (increased metal dissolution) as the potential becomes more positive (noble).
- transpassive state**
(1) State of anodically passivated metal characterized by a considerable increase of the corrosion current, in the; absence of pitting, when the *potential* is increased. (2) The noble region of potential where an electrode exhibits at higher than passive current density.
- triaxial stress**
See *principal stress (normal)*.
- tuberculation**
The formation of *localized corrosion* products scattered over the surface in the form of knobbly mounds called tubercles.