Types of Corrosion

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Corrosion

Corrosion is a natural process that converts a refined metal into a more chemically stable oxide. It is the gradual deterioration of materials by chemical or electrochemical reaction with their environment. Corrosion engineering is the field dedicated to controlling and preventing corrosion.

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Corrosion engineering is an engineering specialty that applies scientific, technical, engineering skills, and knowledge of natural laws and physical resources to design and implement materials, structures, devices, systems, and procedures to manage corrosion.


corrosion

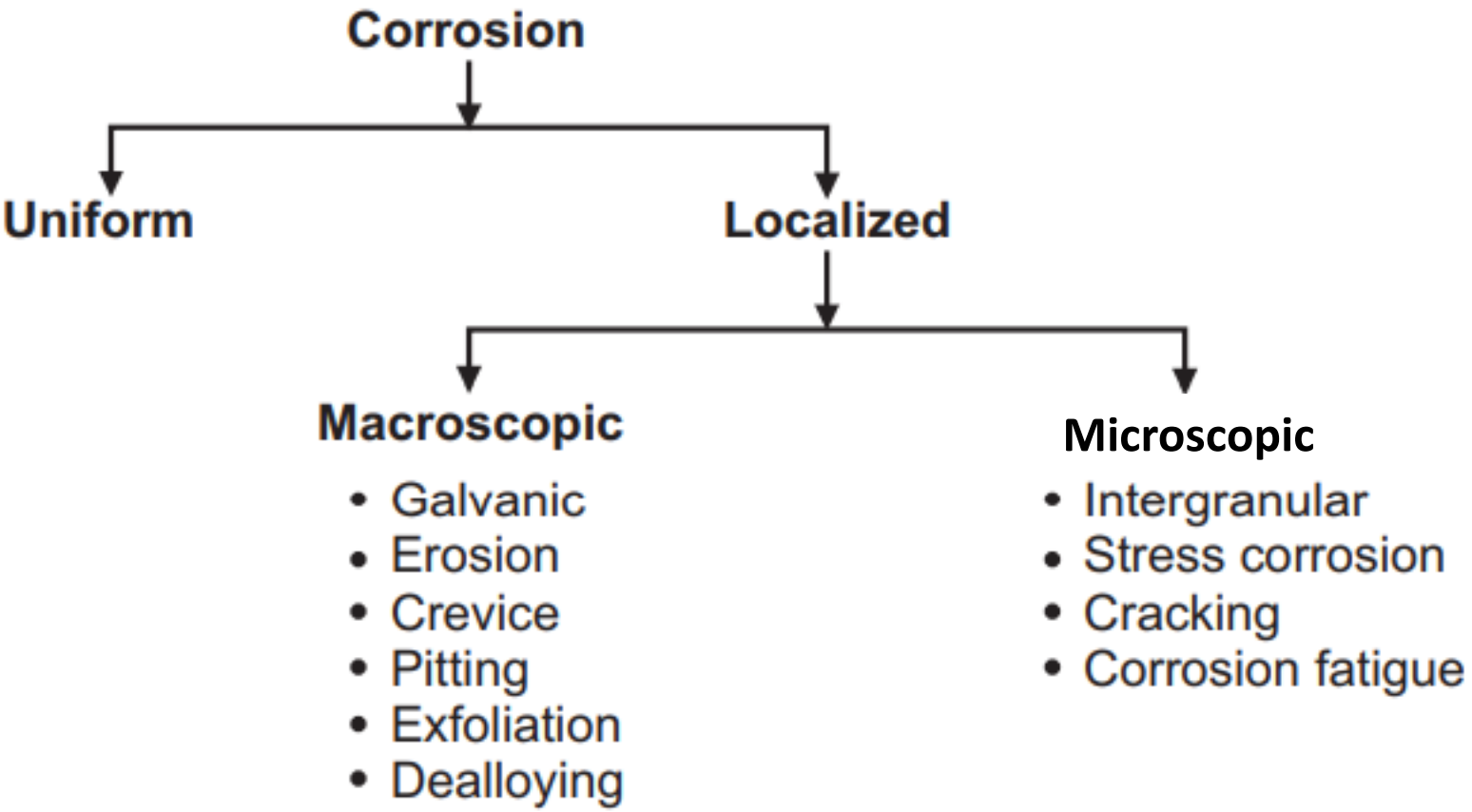
History of Corrosion

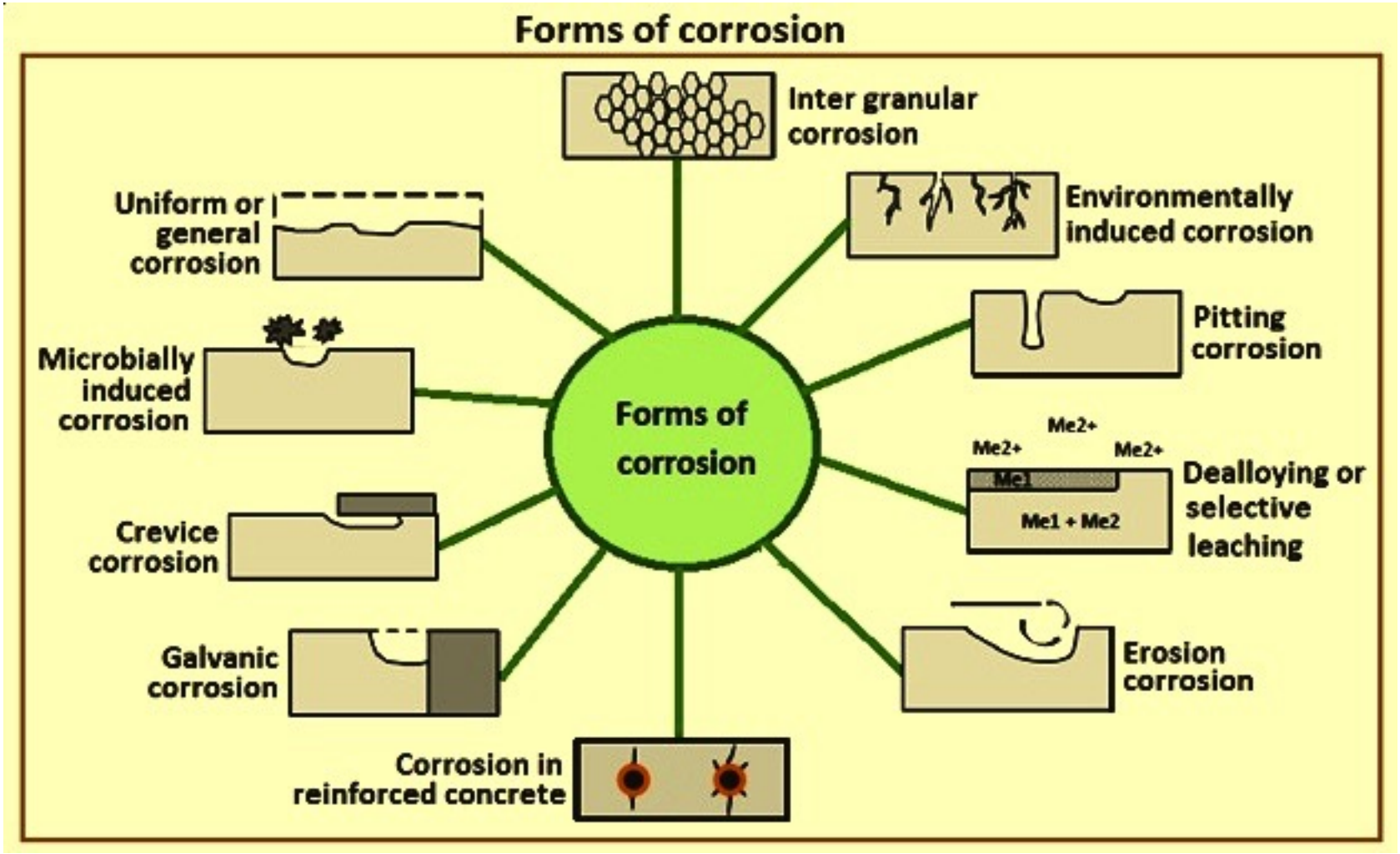
(Ulick Richardson Evans) U.R. Evans in particular played a key role in establishing contemporary understanding of corrosion processes and is often referred to as 'the father of corrosion science'.

Dr. **Evans** is a distinguished scientist, who has written five books and about two hundred papers on electrochemistry and corrosion.

Ulick Richardson Evans
March 1889 - April 1980
(United Kingdom)

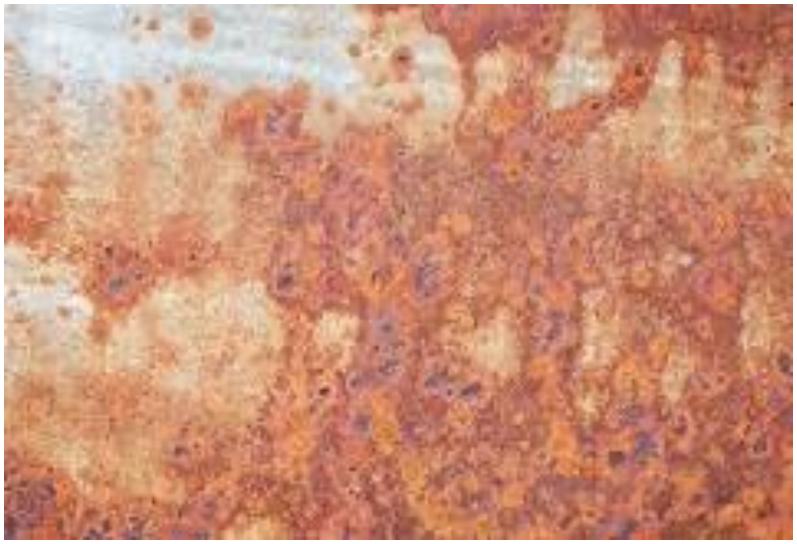
Types of Corrosion




Forms of corrosion
Forms of corrosion
Inter granular corrosion
Environmentally induced corrosion
Pitting corrosion
Dealloying or selective leaching
Erosion corrosion
Corrosion in reinforced concrete
Galvanic corrosion
Crevice corrosion
Microbially induced corrosion
Uniform or general corrosion
Me2+
Me2+
Me2+
Me1
Me1 + Me2

Uniform Corrosion

Uniform corrosion, also known as general corrosion, is the uniform loss of metal over an entire surface. However, it is not regarded as the most serious form of corrosion of stainless steel because it is relatively easy to predict. This type of corrosion is perhaps the most well known corrosion type in existence.



Crevice Corrosion

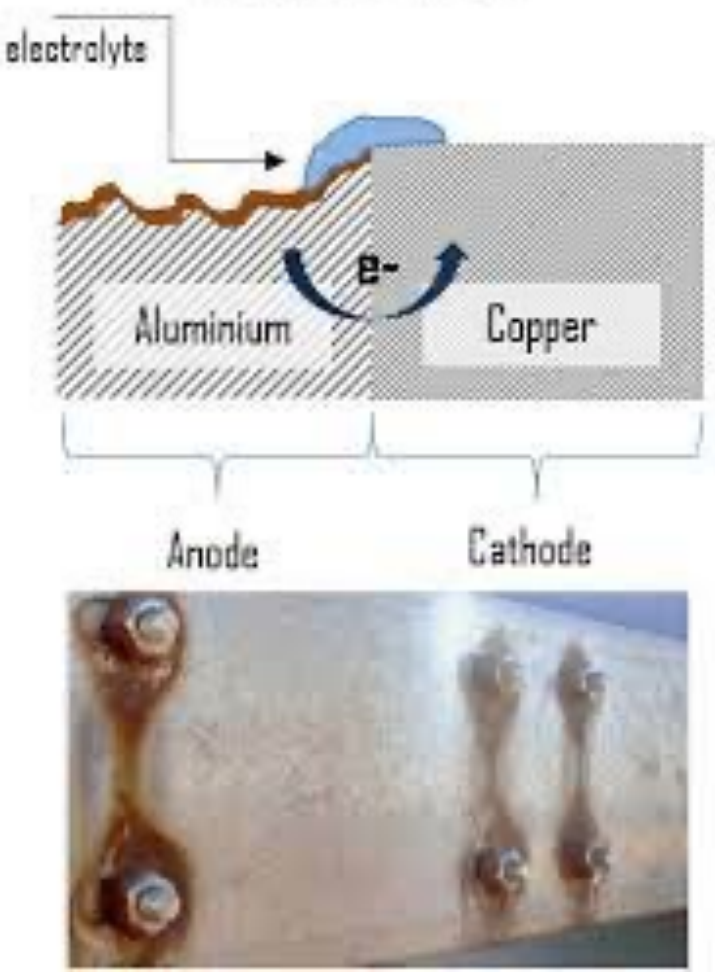
Crevice corrosion refers to corrosion occurring in occluded spaces such as interstices in which a stagnant solution is trapped and not renewed. These spaces are generally called crevices.

Pitting Corrosion

Pitting corrosion is a localized form of corrosion by which cavities or "holes" are produced in the material. Pitting is considered to be more dangerous than uniform corrosion damage because it is more difficult to detect, predict and design against. Corrosion products often cover the pits.

Galvanic Corrosion

Galvanic corrosion (also called ' dissimilar metal corrosion' or wrongly 'electrolysis') refers to corrosion damage induced when two dissimilar materials are coupled in a corrosive electrolyte. It occurs when two (or more) dissimilar metals are brought into electrical contact under water.



Stress Corrosion Cracking

Stress corrosion cracking (SCC) is the cracking induced from the combined influence of tensile stress and a corrosive environment. The impact of SCC on a material usually falls between dry cracking and the fatigue threshold of that material.

Filiform Corrosion

Filiform corrosion is a form of corrosion specific to painted steel, aluminium and magnesium surfaces. It results in a detachment of the coating from its metallic support, which is caused by the surface corrosion of the underlying metal at the metal/coating interface.

Hydrogen Embrittlement

Hydrogen embrittlement, also known as hydrogen-assisted cracking or hydrogen-induced cracking, is a reduction in the ductility of a metal due to absorbed hydrogen. Hydrogen atoms are small and can permeate solid metals.

Microbial Corrosion

Microbial corrosion, also called microbiologically influenced corrosion, microbially induced corrosion or biocorrosion, is "corrosion affected by the presence or activity of microorganisms in biofilms on the surface of the corroding material." This corroding material can be either a metal or a nonmetal.

Corrosion Fatigue

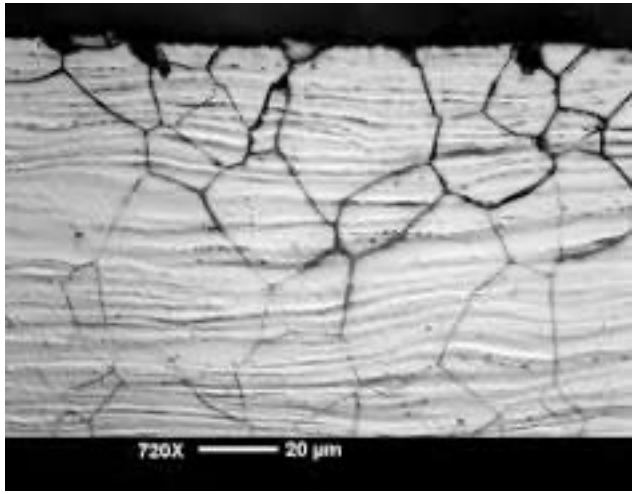
Corrosion fatigue is fatigue in a corrosive environment. It is the mechanical degradation of a material under the joint action of corrosion and cyclic loading. Nearly all engineering structures experience some form of alternating stress, and are exposed to harmful environments during their service life.

Fretting Corrosion

Fretting refers to wear and sometimes corrosion damage of loaded surfaces in contact while they encounter small oscillatory movements tangential to the surface. Fretting is caused by adhesion of contact surface asperities, which are subsequently broken again by the small movement.

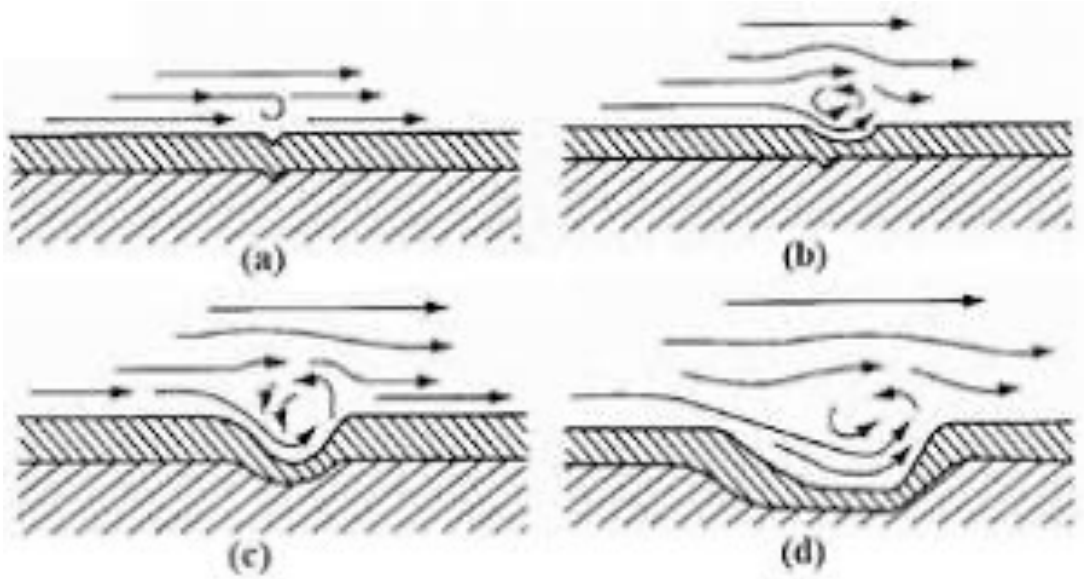
Intergranular corrosion

Intergranular corrosion (IGC) is a form of localized corrosion characterized by preferential corrosion at grain boundaries or areas adjacent to them, with little or negligible attack on the grains. Similarly, to other forms of localized corrosion, it mainly occurs on passive alloys exposed to specific corrodents.



Erosion Corrosion

Erosion corrosion is an acceleration in the rate of corrosion attack in metal due to the relative motion of a corrosive fluid and a metal surface. The increased turbulence caused by pitting on the internal surfaces of a tube can result in rapidly increasing erosion rates and eventually a leak.



Selective Corrosion

Selective corrosion is observed in alloys in which one part or impurity is clearly less noble than the other parts of the material. The corrosion mechanism implies that the less noble element is removed from the material. A porous material with very low strength and ductility is the result. The most well known example is the dezincification of brass (e.g. 70Cu - 30Zn). In this case, the brass takes on a red coppery tinge as the zinc is removed. It also becomes porous and very brittle

Dry corrosion

Dry corrosion or oxidation occurs when oxygen in the air reacts with metal without the presence of a liquid. Typically, dry corrosion is not as detrimental as wet corrosion, but it is very sensitive to temperature. If you hold a piece of clean iron in a flame, you will soon see the formation of an oxide layer!

Wet Corrosion

Wet corrosion refers to the degradation and/or rust formation on a metal surface that occurs due to the generation of a reactive electrochemical cell. Wet corrosion can damage metal structures and equipment, including stainless steel.

Underground Corrosion

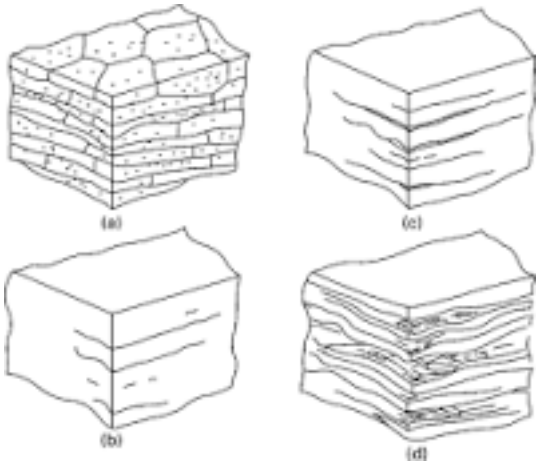
Underground corrosion is electrochemical in character, and this fact is used to describe the corrosion process in terms of an ordinary dry cell

Atmospheric Corrosion

Atmospheric corrosion is the degradation of materials caused by air and the pollutants contained in the air. It can be precisely defined as an electrochemical process which depends upon the presence of electrolyte which may be rain, dew, humidity or melting snow.

Exfoliation Corrosion

Exfoliation corrosion is a severe type of intergranular corrosion that raises surface grains from metal by forming corrosion products at grain boundaries under the surface. It is frequently found on extruded sections where grain thickness is not as thick as the rolled grain.

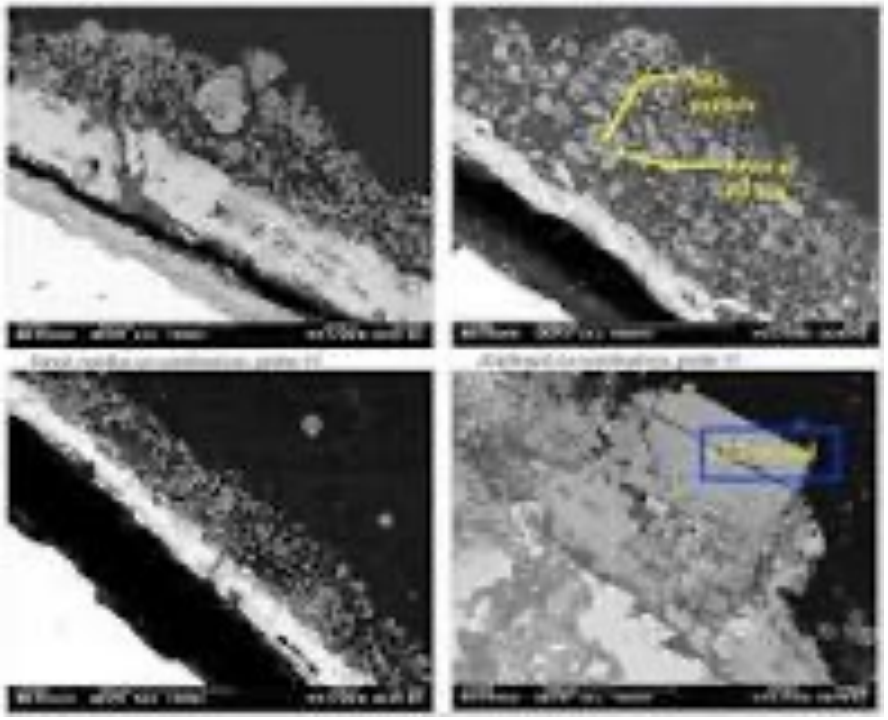


Dealloying

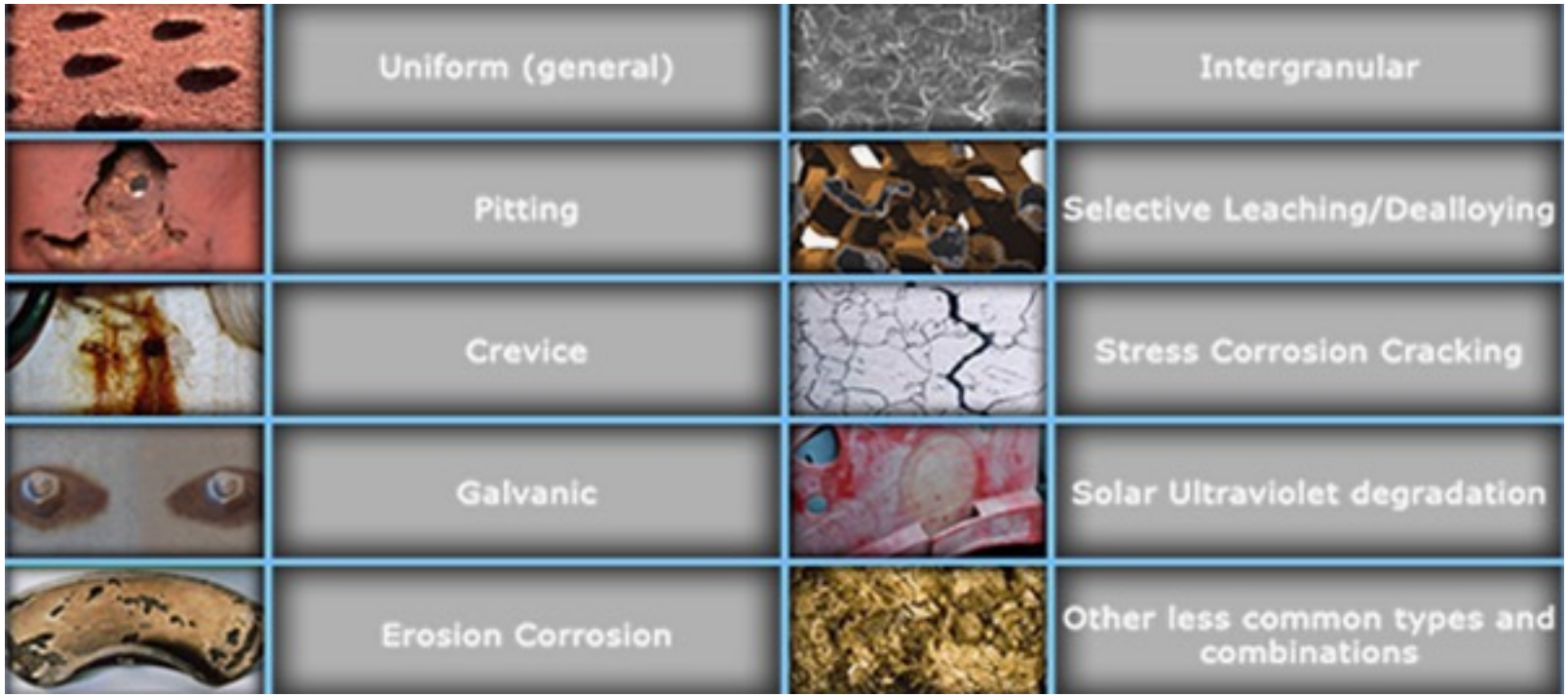
Selective leaching, also called dealloying, demetalification, parting and selective corrosion, is a corrosion type in some solid solution alloys, when in suitable conditions a component of the alloys is preferentially leached from the initially homogenous material.

High Temperature Corrosion

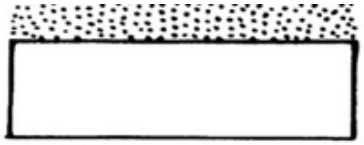
High-temperature corrosion refers to a chemical attack from gases, solid or molten salts, or molten metals, typically at temperatures above 400°C (750°F). Examples of high-temperature corrosion are: Carburization. Chlorination.



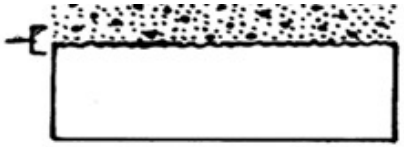
Underground corrosion



Corrosion



Uniform



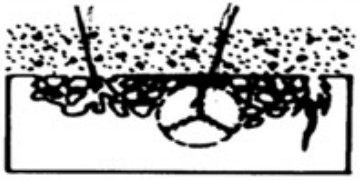
Intergranular

Galvanic

Crevice

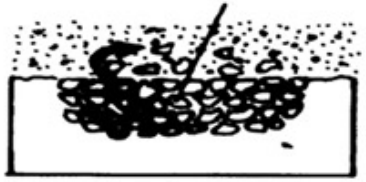
Pitting

Surface cracks Internal voids

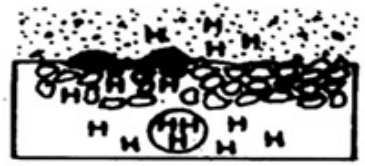


Hydrogen damage

Stress corrosion

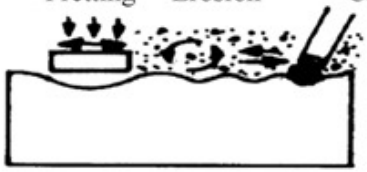


Corrosion fatigue



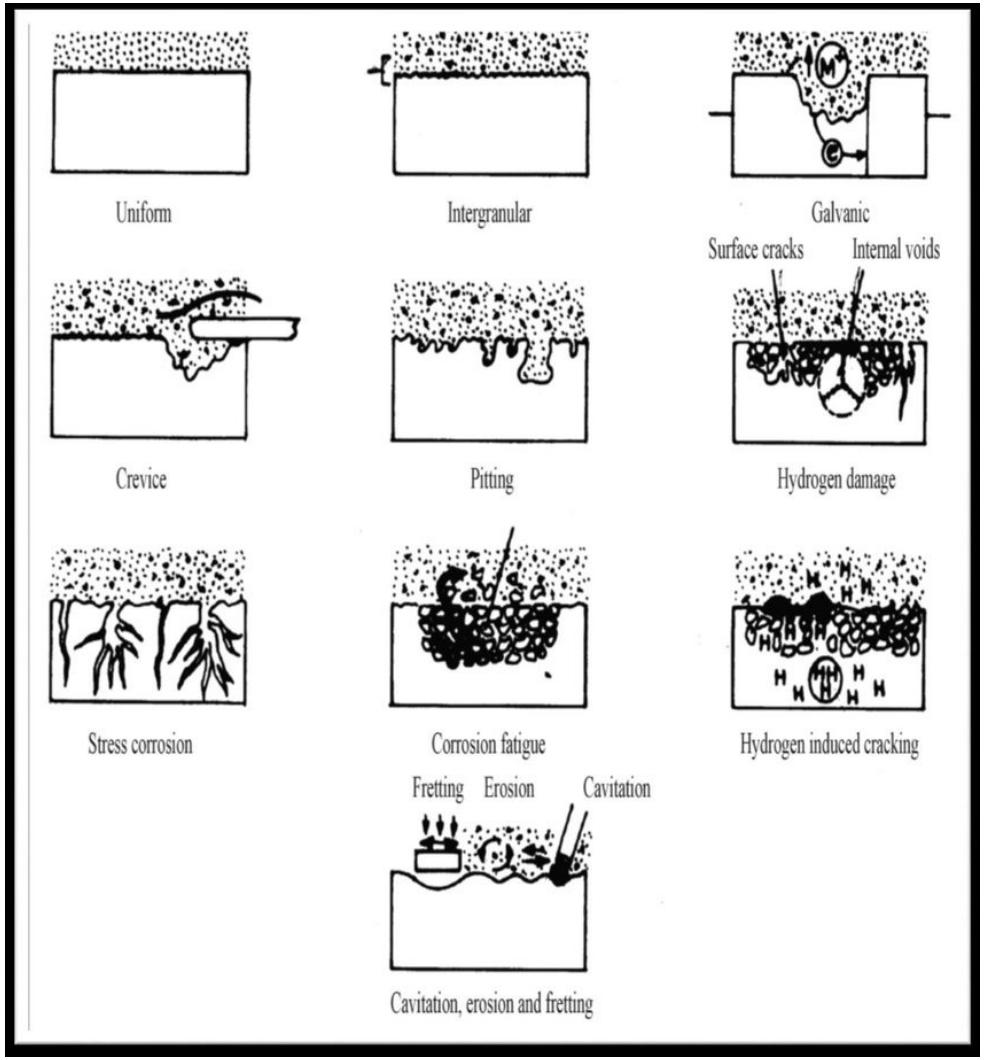
Hydrogen induced cracking

Fretting Erosion Cavitation



Cavitation, erosion and fretting

Corrosion



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Recommended books and sources

1. Corrosion Engineering by Mars G. Fontana
2. Corrosion Science and Engineering by Pietro Pedeferri
3. ASM Handbook, Volume 13C, Corrosion: Environment and Industries
4. Corrosion and Corrosion Control by R. Winston Revie and Herbert H. Uhlig
5. Principles of Corrosion Engineering and Corrosion Control by Zaki Ahmed
6. www.google.com

Thank you
for
kind attention