Summary | Degradation

Introduction

Corrosion

Deterioration of metals due to the reaction with the environment.

All corrosion reactions are electrochemical in nature.

Electrochemical reactions

Pair of reactions in which electron transfer occurs from one reaction to another.

Oxidation

The reaction where an electron is released. Aka. anodic reaction.

Reduction

The reaction where an electron is consumed. Aka. cathodic reaction.

Anode

The site at which oxidation takes place.

Cathode

The site at which reduction takes place.

Common reactions

Hydrogen evolution reaction (HER)

$$2H^+ + 2e^- \rightarrow H_2$$

Oxygen reduction reaction (ORR)

$$O_2 + H_2O + 4e^- \rightarrow 4OH^-$$

Standard Electrode Potential

Whether a metal becomes anode/oxidizes or cathode/reduces depends on its E^0 value. Measured in reference to hydrogen.

The metal with the least E^0 becomes the anode.

Cell

When 2 electrodes are electrically connected.

Cell potential

Absolute difference between the 2 electrode's standard electrode potentials. Denoted by ΔE^0.

For a corrosion reaction to occur spontaneously, $\Delta E^0 > 0$. Cell potential is an indication of the rate of corrosion.