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**15/ENG01/014**

**CHE582**

**CHEMICAL ENGINEERING**

1. **Corrosion** is a natural process that converts a refined metal into a more chemically stable form such as oxide, hydroxide, or sulfide. It is the gradual destruction of materials (usually a metal) by chemical and/or electrochemical reaction with their environment.

2. Metallic corrosion in aqueous solution consists of the anodic dissolution of metals and the cathodic reduction of oxidants present in the solution. These reactions are charge-transfer processes that occur across the interface between the metal and the aqueous solution.

The electrochemical corrosion process involves two reactions,

1. Oxidation reaction at the anode
2. Reduction at the cathode.

|  |  |  |
| --- | --- | --- |
| Anode | $$Fe\_{(s)}\rightarrow Fe^{2+}+2e^{-}$$ | **(1‑1)** |
| Cathode | $$\frac{1}{2}O\_{2}\_{(g)}+H\_{2}O\_{(l)}\rightarrow 2OH^{-}$$ | **(1‑2)** |

(neutral solution)

|  |  |  |
| --- | --- | --- |
| Cathode | $$2H^{+}+2e^{-}\rightarrow H\_{2}\_{(g)}$$ | **(1‑3)** |

(acidic solution)

The overall cell reaction can be obtained by adding the equations

|  |  |  |
| --- | --- | --- |
|  | $$Fe\_{(s)}+\frac{1}{2}O\_{2}\_{(g)}+H\_{2}O\_{(l)}\rightarrow Fe(OH)\_{2}\_{(s)}$$ | **(1‑4)** |

Further oxidization of $Fe(OH)\_{2}$ yields $Fe(OH)\_{3}$

3. Major Catastrophes due to corrosion

1. 06/24/2013 Damage of a turbine engine (England)
2. 08/19/2000 The explosion of a gas pipeline (New Mexico)
3. 12/12/1999 Sinking of the tanker Erika (Bay of Biscay /France)