

Corrosion: Definition, Types, and Prevention

Introduction

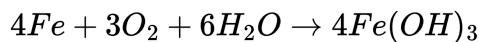
Corrosion is the gradual destruction or deterioration of metals and alloys due to their interaction with the environment. It is a significant problem in engineering and industry, leading to material failure, increased maintenance costs, and safety hazards[1].

Mechanism of Corrosion

Corrosion typically occurs through an electrochemical process where metals react with substances such as oxygen, water, acids, or salts:



A classic example is iron rusting in the presence of water and oxygen:



Common Types of Corrosion

Type	Description	Example
Uniform	Even surface loss	Rust on iron pipes
Galvanic	Metal-metal contact, different potentials	Zinc-iron in batteries
Pitting	Localized holes	Stainless steel in chlorides
Crevice	In narrow gaps	Bolted joints in seawater
Intergranular	Along grain boundaries	Welds in austenitic steels

Table 1: Major types of corrosion and examples[2]

Corrosion Prevention Strategies

- Protective coatings (paint, plating)
- Use of corrosion-resistant alloys (stainless steel, aluminum alloys)
- Cathodic protection (sacrificial anodes)
- Environmental control (humidity, pH)
- Regular inspection and maintenance

Industrial Impact

Corrosion affects infrastructure (bridges, pipelines), transport (automobiles, ships), and manufacturing equipment, often causing billions of dollars in annual losses worldwide[3].

References

- [1] Jones, D.A. (2024). Principles and Prevention of Corrosion (3rd ed.). Pearson Education.
- [2] Fontana, M.G. (2023). Corrosion Engineering. McGraw-Hill Education.
- [3] National Association of Corrosion Engineers (NACE). (2025). The Global Cost of Corrosion Report. <https://www.nace.org/global-cost-of-corrosion>