

GALVANIZATION AND PROCESS

Definition of Galvanization

Galvanization is the process of applying a thin, protective coating of Zinc (Zn) over iron or steel to prevent them from rusting.

The most remarkable feature of galvanization is that it provides protection even if the zinc coating is scratched or broken. This is because Zinc is more reactive than Iron and acts as a sacrificial metal.

2. The Process: Hot-Dip Galvanizing

The most common industrial method is "Hot-Dip Galvanizing." It involves several precise steps to ensure the zinc bonds perfectly with the metal surface:

Step 1: Surface Preparation (Cleaning)

Degreasing: Removing oil, grease, or dirt using a hot alkali solution.

Pickling: The metal is dipped in dilute Hydrochloric Acid (HCl) or Sulphuric Acid (H₂SO₄) to remove any existing rust or scale.

Fluxing: The metal is dipped in a zinc ammonium chloride solution to remove any remaining oxides and to help the zinc bond.

Step 2: The Galvanizing Bath

The clean iron or steel item is submerged into a kettle containing molten Zinc at a temperature of approximately 450°C (842°F).

While in the bath, the iron reacts with the molten zinc to form a series of zinc-iron alloy layers.

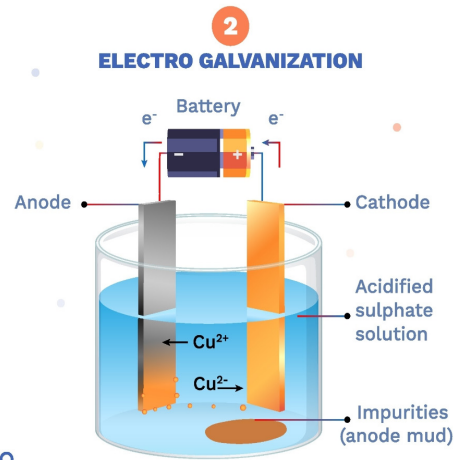
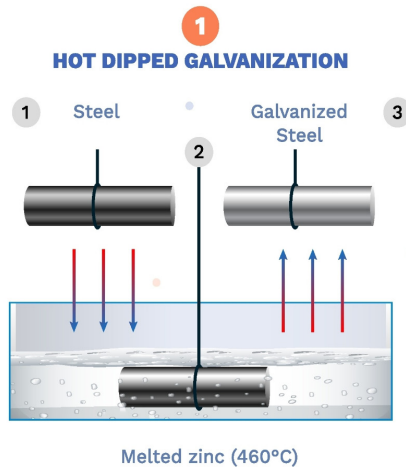
When the item is pulled out, a top layer of pure zinc is formed on the outer surface.

Step 3: Cooling and Inspection

The item is cooled in a quenching tank or air-cooled. It is then inspected for thickness and uniformity.

TWO TYPE OF GALVANIZING

Galvanisation or galvanization (or galvanizing as it is most commonly called) is the process of applying a protective zinc coating to iron or steel, to prevent rusting. The most common method is hot dip galvanizing, in which steel sections are submerged in a bath of molten zinc.



3. Why does it work? (The Science)

Barrier Protection: The zinc layer acts as a physical wall, preventing oxygen and moisture from reaching the iron.

Cathodic Protection (Sacrificial Protection): Zinc is higher in the reactivity series than Iron. If the coating is scratched, the zinc "sacrifices" itself by reacting with the oxygen and moisture first, leaving the underlying iron untouched.

4. Examples in Daily Life

Roofing: Galvanized iron (G.I.) sheets used for sheds and roofs.

Piping: G.I. pipes used for water supply to prevent brown, rusty water.

Infrastructure: Electric poles, bridge girders, and chain-link fences.

Automotive: Many car body parts are galvanized to ensure they don't rust over time.

5. Comparison: Galvanization vs. Painting

Feature	Painting	Galvanization
Durability	Short-term; needs frequent repainting.	Long-term; can last 20-50 years.
Scratch Resistance	If scratched, iron starts rusting immediately.	If scratched, Zinc still protects the iron.
Maintenance	High.	Almost zero.