



ENGINEERING CHEMISTRY

Department of Science and Humanities

ENGINEERING CHEMISTRY

Corrosion Chemistry



Class content:

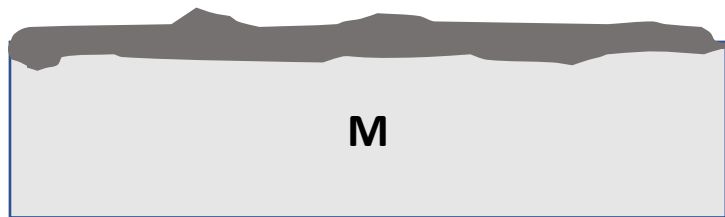
- ***Corrosion control***
 - ***Inorganic coating***
 - ***Anodising***

ENGINEERING CHEMISTRY

Corrosion Chemistry

Inorganic coating

- Referred to as **chemical conversion coating**
- Surface of the base metal is converted into a **protective coating** through appropriate chemical modification
- The protective film (corrosion product) is an **inherent part** of the metal



- Two methods: **Anodising and Phosphating**

ENGINEERING CHEMISTRY

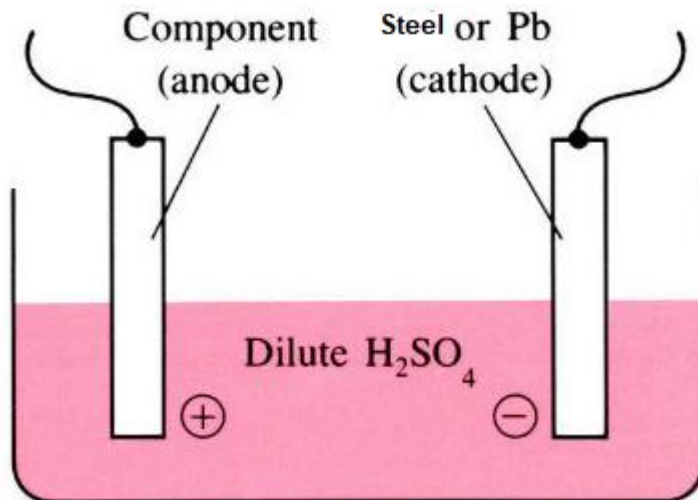
Corrosion Chemistry

Anodizing:

Induced oxidation in an oxidising environment by making the article anode and passing current

Oxidation of outer layer of metal to its metal oxide which covers the metal surface and acts as protective layer

Done for non-ferrous metals like Al, Cr, Ti



Source: <https://www.open.edu/openlearn/science-maths-technology/engineering-technology/manupedia/anodising>

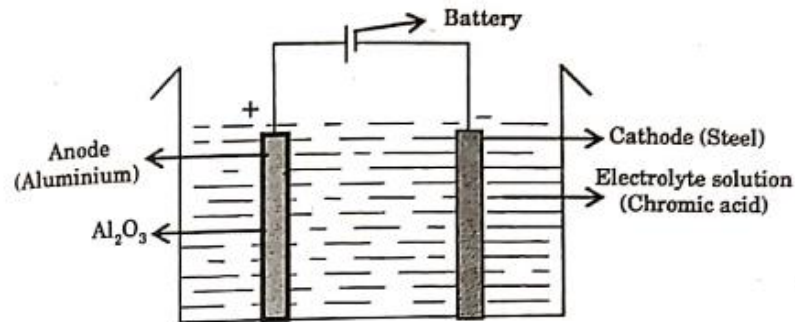
ENGINEERING CHEMISTRY

Corrosion Chemistry

Anodizing of Aluminum:

The process:

- Article is cleaned, degreased, and polished and **taken as anode**
- It is immersed in an **electrolyte** consisting of 5-10% chromic acid, sulfuric acid, phosphoric acid, oxalic acid or their mixtures maintained at around 40° C
- Lead or steel is taken as **cathode**
- **Voltage** above 40V is applied
- Outer layer of **Al is oxidised to Al_2O_3**



Source: Basuchandra's Engineering chemistry,
Banbayalu (2014)

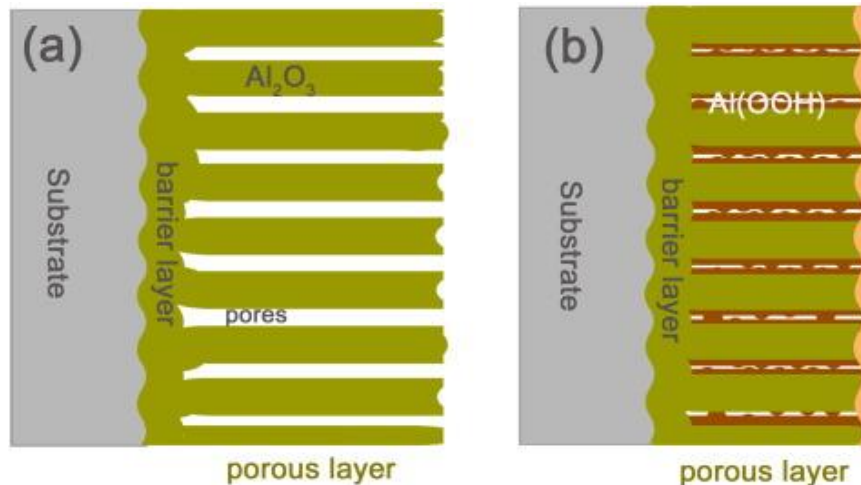
ENGINEERING CHEMISTRY

Corrosion Chemistry

Al_2O_3 formed on the surface is **slightly porous** in nature

The porous layer may be made compact by **sealing** which is done by immersing the anodised article in boiling water or steam

Al_2O_3 is converted into $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$ which occupies **higher volume**; the pores are sealed



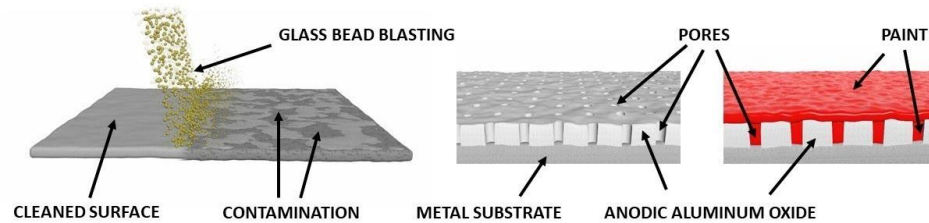
Source: <https://www.sciencedirect.com/science/article/abs/pii/S0257897215304540>

ENGINEERING CHEMISTRY

Corrosion Chemistry

Anodized articles can be produced in **good colour finishes** by

- Adsorbing an **organic dye** after anodising and then sealing
- Depositing a **metal like Ni, Co** etc., into the pores



Source: <https://www.youtube.com/watch?v=w1cKVbt pE1E>

Applications:

- Anodized Al is used as an attractive, highly durable, corrosion resistant material in exteriors for roofs, walls, buildings and also in window frames, office partitions, tiffin carriers, etc.



PES
UNIVERSITY

CELEBRATING 60 YEARS

THANK YOU

Department of Science and Humanities