TARNISH

- Process by which a metal surface becomes dull or discolored.
- The surface finish or luster is altered.
- In this process a thin layer is formed on the metal surface by reaction with sulfide, chloride, oxide or other chemicals.
CORROSION

- A chemical or electrochemical process in which a solid (metal) is attacked by an environmental agent.
- In this process partial or complete dissolution occurs.
- Metals are generally more susceptible to corrosive attack due to electrochemical reactions.
CAUSES OF TARNISH AND CORROSION

- Discoloration comes through iron and mercury containing drugs, food debris, pigment producing bacteria.
- Oxide, sulfide and chloride films also cause TARNISH.
CAUSES OF TARNISH AND CORROSION

- Corrosion occurs by the action of acids, moisture, alkaline solutions, atmosphere or certain chemicals.
- Water, oxygen and chlorine ions in saliva.
- At a specific pH phosphoric, acetic and lactic acids promote corrosion.
CLASSIFICATION OF CORROSION

Two general types of corrosion reactions:

- In chemical corrosion there is direct combination of metallic and non metallic element to form a chemical compound by oxidation, helogenation or sulfurization reactions. e.g. discoloration of silver by sulfur.

- Also referred as “dry corrosion” (occurs in the absence of water or any other fluid electrolyte)
CLASSIFICATION OF CORROSION

- Chemical corrosion is almost invariably accompanied by electrochemical corrosion.
- Also referred as “wet corrosion” (requires the presence of water or some other fluid electrolyte)
- In order to continue the process it requires the pathway for the transport of electrons (electric current).
- More important for dental restorations.
ELECTROCHEMICAL CORROSION

- Based on electrochemical cell.
- 3 basic components.
  1. **ANODE** …. where + ions are formed (oxidation → free electrons are formed)
  2. **CATHODE** … where – ions are formed (reduction → consume free electrons)
  3. **ELECTROLYTE** … supplies ions needed at cathode.

**ELECTRIC CURRENT** …. conduction path to carry electrons from anode to cathode.
For ongoing electrochemical corrosion, oxidation must be balanced by reduction.

Cathodic reactions is considered to be primary deriving force for electrochemical corrosion.

e.g. anode can be dental amalgam, cathode may be gold alloy restoration and saliva as electrolyte.
ELECTROCHEMICAL CORROSION

- GALVANIC CORROSION:
  When dissimilar metals of different compositions are in physical contact.
  Also called as electro-galvanism.
  Occurs by flow of galvanic current.
  Produces galvanic shock.
  Can also occur between the restorations of similar alloys.
Current may also exist in a single isolated metal restoration.

Two different electrolytes (saliva & tissue fluids) causes the current to flow.

The magnitude of these current diminishes as the restoration ages.

Varnish coating eliminates galvanic shock.
ELECTROCHEMICAL CORROSION

STRESS CORROSION:
- Another type of electrochemical corrosion.
- Caused by the combined effects of mechanical stress and corrosive environment.
- Surface irregularities (pits & notches) act as sites of stress concentration.
- Excessive burnishing of margins is contraindicated.
ELECTROCHEMICAL CORROSION

CONCENTRATION CELL CORROSION:

● Occurs whenever there is variation in electrolytes or in composition of given electrolyte in a system.

● e.g. Electrolytes produced by food debris.
  ● Difference in oxygen concentration.
ELECRTOCHEMICAL CORROSION

CREVICE CORROSION:
A type of concentration stress corrosion. Occurs due to microleakage between the restoration and the tooth margins. A good oral hygiene is significant for minimizing these corrosion processes.
PROTECTION AGAINST CORROSION

- Gold coatings over restorations. Ineffective.
- Metallic and non metallic coatings. Ineffective.
  1. too thin.
  2. did not adhere to underlying metal.
  3. could be readily scratched.
  4. easily attacked by oral fluids.
  5. Incomplete.
PROTECTION AGAINST CORROSION

- Incase of 2 dissimilar metals, paint or a non conductive film.
- Formation of oxide layer.
  Pitting corrosion may occurs in the presence of chlorides in the environment, causing the oxide layer to break up.
Corrosion of dental restorations

- Variations in oral environment.
- Diet, bacterial activity, smoking, drugs and oral hygiene habits become important.
- Corrosion resistance is highly important consideration.
- Biocompatibility gets effected.
- No lab test to duplicate oral environment.
- Tests using sulfides, chlorides and other solutions are used.
QUESTIONS???