

Dental Metals and Alloys

Dental metals and alloys are extensively used in dentistry for the restoration and replacement of missing or damaged teeth. They are preferred because of their high strength, durability, corrosion resistance, and biocompatibility. Since the oral cavity is a hostile environment with saliva, fluctuating pH, and mechanical stresses, dental materials must maintain their properties for long periods.

Requirements of an Ideal Dental Metal or Alloy

An ideal dental metal or alloy should possess the following properties:

- High mechanical strength and toughness
- Excellent corrosion and tarnish resistance
- Biocompatibility with oral tissues
- Adequate hardness and wear resistance
- Good castability and ease of fabrication
- Dimensional stability
- Acceptable aesthetic appearance

Classification of Dental Metals and Alloys

Dental metals and alloys are broadly classified into:

1. Noble Metal Alloys

Noble metal alloys contain metals that are highly resistant to corrosion.

Examples: Gold (Au), Platinum (Pt), Palladium (Pd)

Properties: Excellent corrosion resistance, High ductility and
Malleability, Superior biocompatibility

Applications: Dental crowns, Bridges, Inlays and onlays

2. Base Metal Alloys

Base metal alloys are strong and economical compared to noble alloys.

Examples: Nickel–Chromium (Ni–Cr), Cobalt–Chromium (Co–Cr),
Stainless steel

Properties: High strength and hardness, Good wear resistance

Lower cost

Applications: Partial denture frameworks, Orthodontic wires, Dental
Prosthesis

3. Titanium and Titanium Alloys

Examples:

Commercially pure titanium, Ti–6Al–4V alloy

Properties: Excellent biocompatibility, High corrosion resistance,
Low density and high strength

Applications: Dental implants, Implant-supported prostheses

4. Dental Amalgams

Dental amalgam is an alloy formed by mixing mercury with other

metals.

Composition: Mercury, Silver, Tin, Copper

Properties: High compressive strength, Good durability, Easy
manipulation

Applications: Posterior tooth restorations

Properties of Dental Metals and Alloys

- Mechanical strength: Withstand mastication forces
- Corrosion resistance: Resist degradation in saliva
- Biocompatibility: Safe and non-toxic
- Thermal conductivity: Important for patient comfort
- Wear resistance: Ensures long service life

Applications of Dental Metals and Alloys

- Crowns and bridges
- Dental implants
- Orthodontic appliances
- Restorative fillings
- Denture frameworks

Advantages

- High durability and long service life

- Excellent mechanical strength
- Good corrosion resistance
- Suitable for load-bearing dental restorations

Limitations

- Poor aesthetics compared to ceramics
- Possible allergic reactions (especially Ni-based alloys)
- High thermal conductivity may cause sensitivity
- Mercury toxicity concerns in amalgams



