

Dental amalgam Amalgam restorations

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Cariestherapy

Requirements

- Biocompatibility
- Adequate mechanical properties:
 - press, strain, flex coefficient, resistivity
 - elasticity
 - surface hardness
 - abrasion resistance
- Shape/form and volume stability
 - tooth-similar thermal expansion

Cariestherapy

Requirements

- Resistance against humidity, indissolubility, bonding
- Thermal and electrical isolation
- Antiseptic effect, caries-prophylactic properties
- Radiopacity
- Tooth-similar optical properties
- Simple application, finishing, polishing
- Easy removal
- Low price

Restorative dental materials

- Temporary restorative materials
- Liners and bases
- Definitive restorative materials
 - Direct restorative dental materials (plastic)

Amalgams

Cement

Cermet Cement

Polymers

Composite

- Indirect restorative dental materials (solid)

Metal

Ceramic

Glass-ceramic

Direct Ceramic (Cerec)

Gold-ceramic

Composite

Indirect restorations

Inlays - Onlays

Metal

Ceramic

Glass-ceramic

Direct Ceramic (Cerec)

Gold-ceramic

Composite

Amalgam

An alloy of mercury with any other metal

Dental amalgam:

mercury and silver-tin alloy,
plus copper and zinc

biner, tertier, quaterner etc.

amalgams

Classification

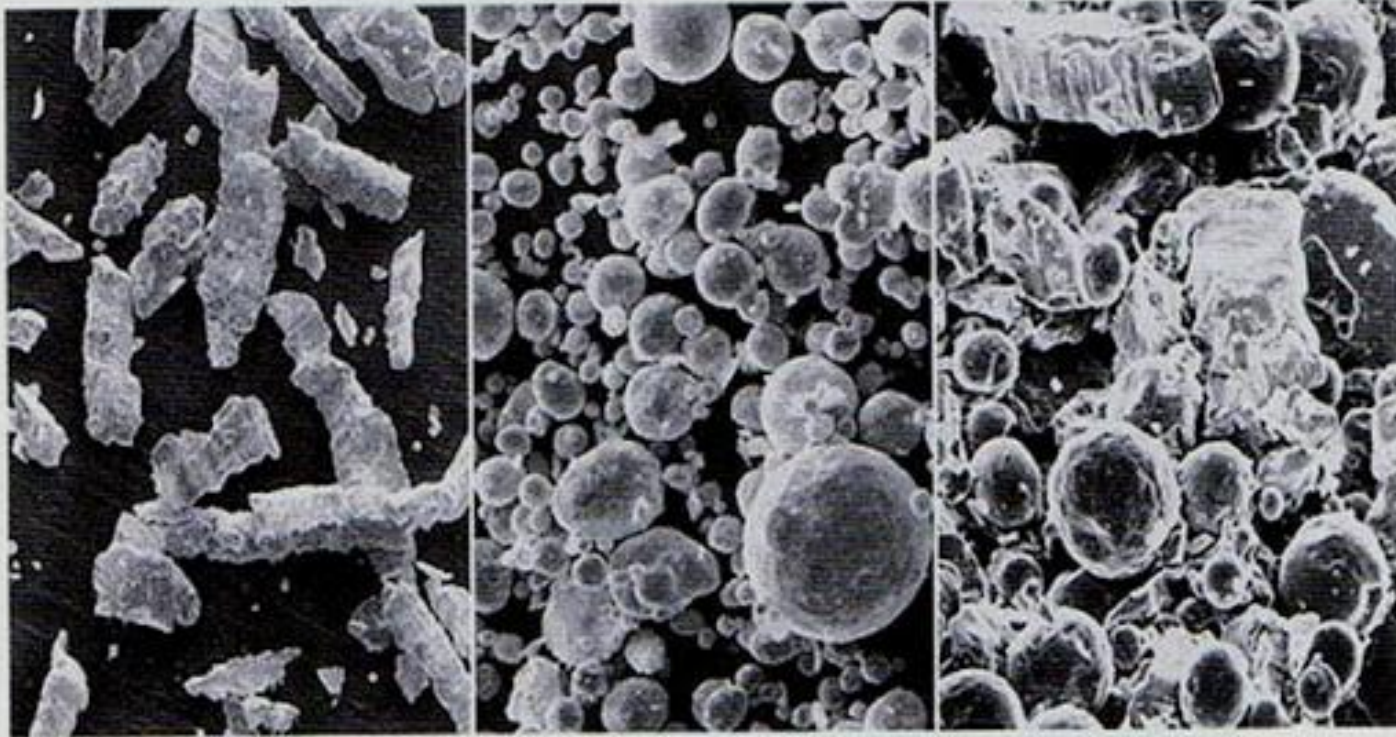
in terms of

- **Dental amalgam alloy particle geometry and size**
- **Copper content**
- **Zinc content**

Classification

in terms of

- **Dental amalgam alloy particle geometry and size**
 - **filings**
 - **lathe-cut particles**
 - **spherical**
 - **mixed geometries**
- **Copper content**
- **Zinc content**



200 μm

40 μm

40 μm

A

B

C

→ Micrographs of alloy particles. A, Irregular. B, Spherical. C, Admixed with irregular and spherical particles.

by milling
an ingot

by atomizing
liquid alloy

mixture

Classification

in terms of

- **Dental amalgam alloy particle geometry and size**
- **Copper content**
 - **Low-copper dental amalgams**
2-5 %
 - **High-copper dental amalgams**
12-30 %
- **Zinc content**

Classification

in terms of

- **Dental amalgam alloy particle geometry and size**
- **Copper content**
- **Zinc content**
 - **Zinc-containing**
 - **Zinc-free**

Materials properties

- Physical properties
- Mechanical properties
- Chemical properties
- Biological properties

Materials properties 1.a.

- Physical properties
 - Mass
 - Thermal
 - Electrical
 - Optical
 - Surface properties
- Mechanical properties
- Chemical properties
- Biological properties

Materials properties 1.b

- Physical properties
 - Coefficient of thermal expansion/contraction
 - percolation (egress/ingress of fluids)
 - heat flow – thermal conductivity
 - Electrical conductivity
 - Mass properties density
 - Optical properties – color, radiopacity
 - Surface properties

Materials properties 2.

- Physical properties
- Mechanical properties
 - Stresses and strains within a material as a result of an external force
 - Response to loading, compression, tension, shear, torsion, flexion, hardness
- Chemical properties
- Biological properties

Materials properties 3.

- Physical properties
- Mechanical properties
- Chemical properties
 - Chemical and electrochemical interactions
 - Chemical and electrochemical corrosion
- Biological properties

Materials properties 4.

- Physical properties
- Mechanical properties
- Chemical properties

- **Biological properties**

Characterization of

- » toxicity (threshold level) and
- » sensitivity reaction

during clinical use



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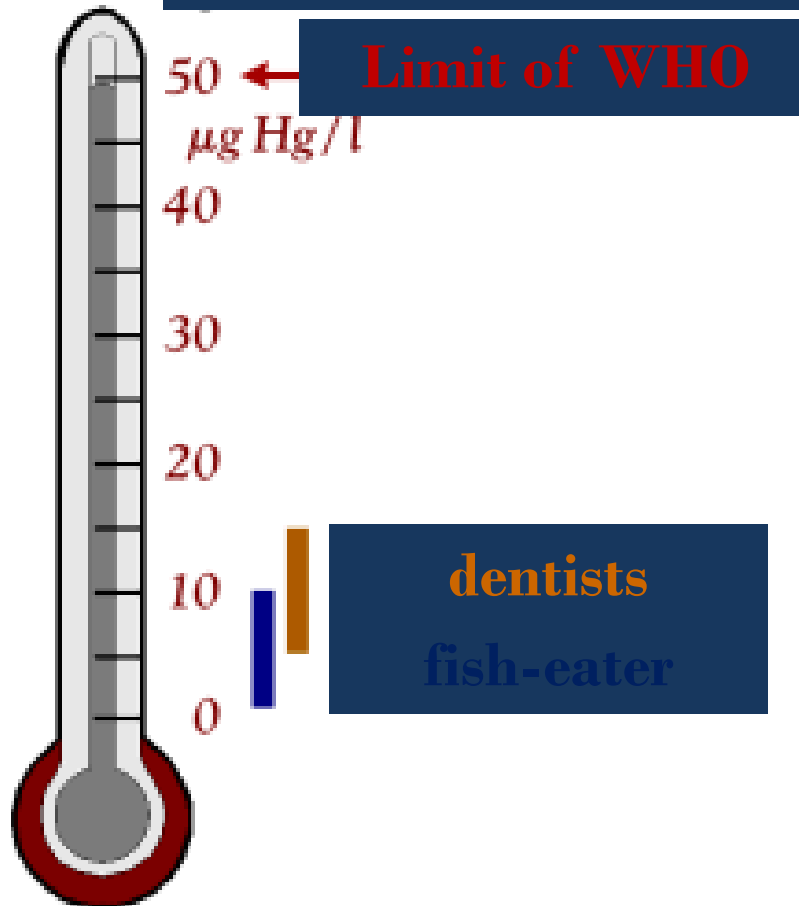
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Properties of dental amalgams

1. volumetrical stable
2. indissoluble
3. mechanical resistance
4. ductility
5. *thermal and electrical conductivity*
6. *corrosion*
7. non-toxic!!!!
sensitivity (allergy): rare
8. radiopacity
9. *colour*
10. amalgam with F⁻ content
11. price

Mercury in urine



- initial contraction (1 h)
- transient expansion (1-3 h)
- final contraction (24 h)
 - . flow 3-24 h
 - . creep after 24 h
- delayed expansion –
mercuoscopic expansion