



# Cements in Orthodontics

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# Classification by Composition

## ❖ Phosphate

- ☛ Zinc Phosphate cement
- ☛ Silicophosphate cement

## ❖ Phenolate

- ☛ Zinc Oxide-eugenol cement

## ❖ Polycarboxylate

- ☛ Zinc polycarboxylate
- ☛ Glass Ionomer cements

# Properties of Cements

- Adequate handling and setting time
- High tensile, compressive, and shear strength
- Resistance to dissolution
- Clinically acceptable bond strength
- Low adhesive remnants index score
- Anticariogenic potential

# Zinc Phosphate Cement

- Powder is zinc oxide and magnesium oxide
- Magnesium oxide improve the mechanical properties
- Some brands has 10% fluoride
- The liquid is aqueous solution of phosphoric acid with concentration of 45-64%



# Zinc Phosphate Cement

## ■ Advantages

Good Physical properties

Minimal effect on the oral tissues

## ■ Disadvantages

Brittle

Does not bond to enamel

Does not bond to metal

Mixing is technique sensitive

# Zinc Phosphate Cement

- Powder to liquid ratio affects the working and setting time
- Thin consistency is required when used as a luting agent for orthodontic bands
- Working time is 3-6 minutes
- Setting time is 5-9 minutes
- Powder should be incorporated into the liquid in small portions

# Zinc Polycarboxylate Cement

- Powder is zinc oxide, magnesium oxide
- Liquid is aqueous solution of acrylic acid or polycarboxylic acids
- Fluoride can be added
- The carboxyl groups are responsible for the chemical adhesion to enamel and dentin and metals

# Zinc Polycarboxylate Cement

- Have a short setting time
- Working time is 2-5 minutes
- Working time can be increased by lowering the temperature of the glass slab



# Zinc Polycarboxylate Cement

## ■ Advantages

Good Physical properties

Biocompatible

Chemical adhesion to enamel and metal

## ■ Disadvantages

Mixing is technique sensitive

High solubility

Low fracture resistance

# Glass Ionomer Cements

- They were developed by Wilson and Kent in the early 1970's
- Their greatest advantage is fluoride release
- The powder is calcium fluoroaluminosilicate glass particles
- Fluoride content is high 10-23%
- Liquid is polyacrylic acid
- Have higher bond strength to enamel, dentin and metals



# Glass Ionomer Cements

- Powder and liquid
- Dual cure
- Cure for 20 seconds and sets in 5 minutes



# Two Paste-Dual Cure System Band-lock from Reliance

- Glass Ionomer cement
- No powder and liquid mixing
- Dual cure



# Single Paste Glass Ionomer Ultra Band-lock from Reliance



# Single Paste Light Cure Band Adhesive

- No mixing
- Excellent working time and handling
- Fluoride release
- More consistent adhesive performance
- Less chair time
- Blue in color for ease of excess removal



Table 11.2 Properties of three major types of cements

Properties	Zinc Phosphate Cements	Zinc Polycarboxylate Cements	Glass-Ionomer Cements (luting consistency)
Working time (min)	3–6	2–5	3–5
Setting time (min)	5–9	6–9	5–9
Film thickness ( $\mu\text{m}$ )	20	20	25–35
Compressive strength ( $\text{MPa}$ ) <sup>a</sup>	80–140	48–80	90–140
Tensile strength ( $\text{MPa}$ ) <sup>a</sup>	5–7	8–12	6–8
Diametral tensile strength ( $\text{MPa}$ ) <sup>a</sup>	5	6	6.5–8
Modulus of elasticity ( $\text{GPa}$ ) <sup>a</sup>	9–13	3–6	3.5–4
Solubility ( $\text{wt}\%$ ) <sup>a</sup>	0.04–3.3	0.1–0.6	1

<sup>a</sup> Values after 24 hours.