

## Concept and Technological Design of New Composite Resins

Majesty Symposium  
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Frankfurt

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Dental Material Div.  
Kuraray Medical Inc.



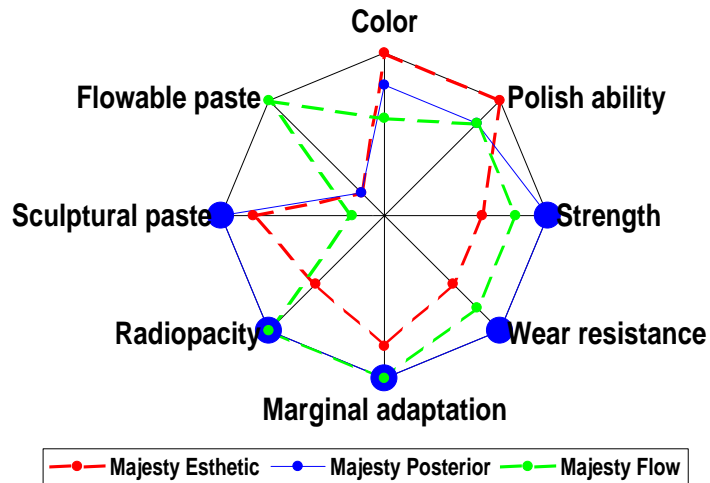
### Clearfil Majesty Posterior

(Composite resin for posterior restoration)

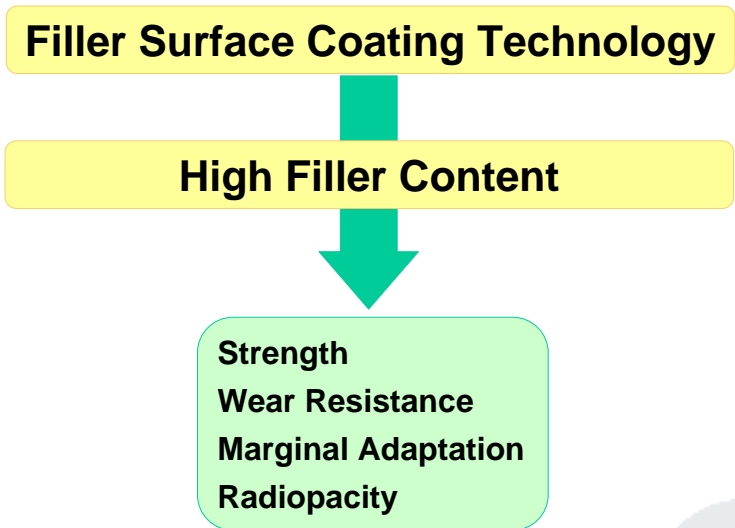


*Nano-Superfilled Hybrid Composite Reliable Strength, Wear  
Resistance and Marginal Adaptation*

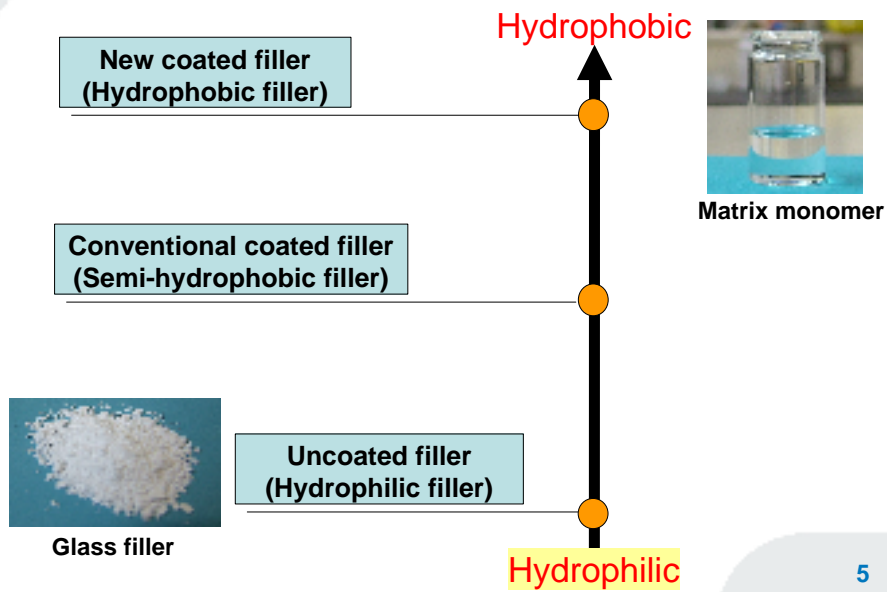
### Concept of Majesty Posterior



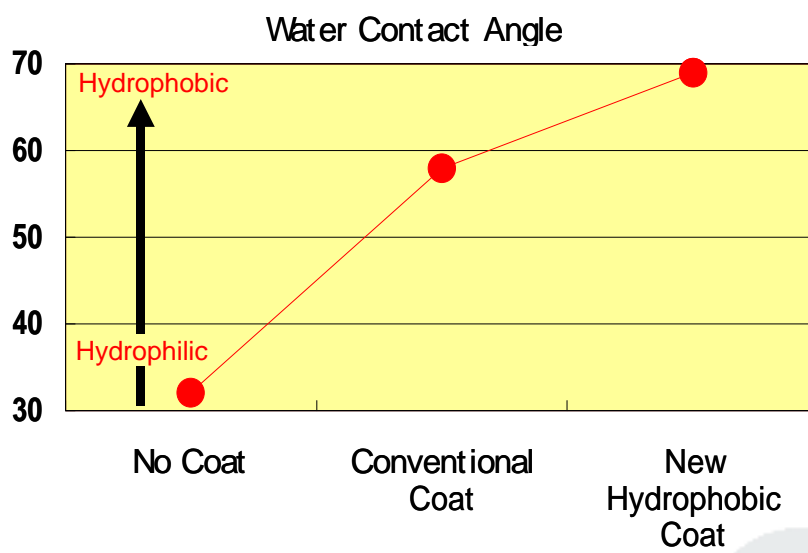
### Key Technology



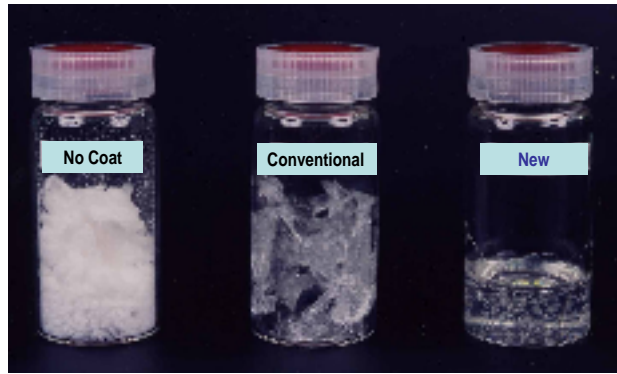
### Wetability between Filler and Monomer



### Surface Coat for Higher Filler Content



### Hydrophobic Coated Filler



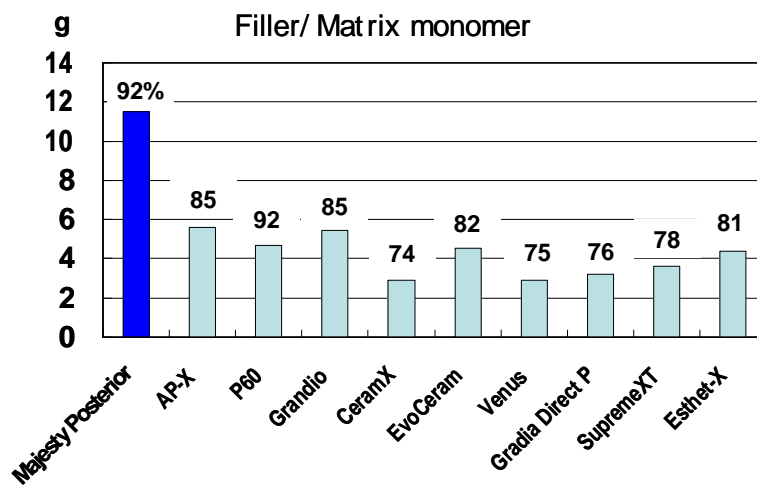
No Coat

Conventional Coat

**New Hydrophobic Coat**

Filler : SiO<sub>2</sub>  
Monomer : Bis-GMA/TEGDMA

### Filler Content



Source: Kuraray Medical Inc., Japan

### Filler Content for Majesty Posterior

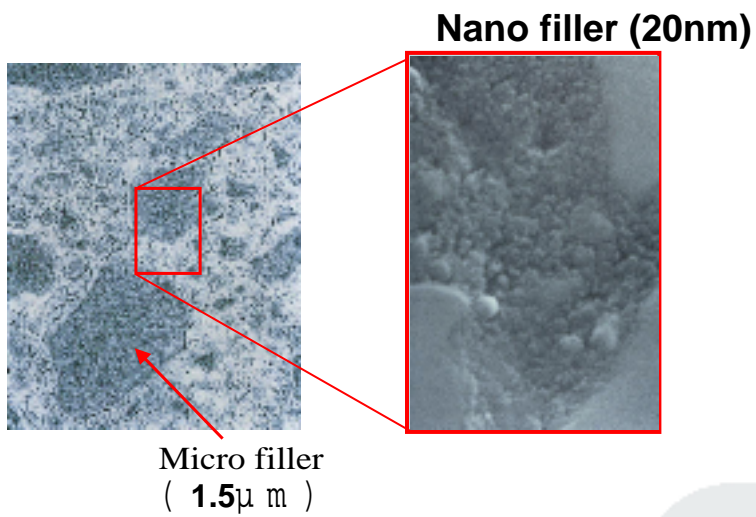


Matrix Monomer

Micro Filler

Nano Filler

### Micro Structure



## Principal Ingredients

**Fillers : 92 wt% (82 vol%)**

- Micro filler (Glass filler) : 1.5  $\mu\text{m}$  (average)
- Nano filler : 20 nm (average)

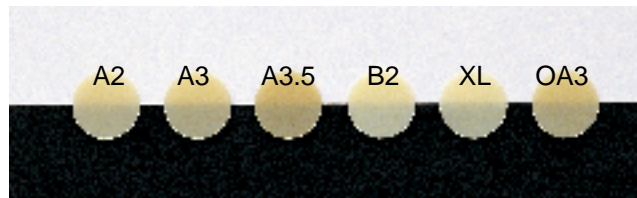
**Monomer : 8 wt%**

- Hydrophobic aromatic dimethacrylate
- BisphenolA diglycidylmethacrylate (Bis-GMA)
- Trietheneglycol dimethacrylate (TEGDMA)
- dl-Camphorquinone
- others

**Shades (6 shades) : A2, A3, A3.5, B2, XL, OA3**

## List of Shades

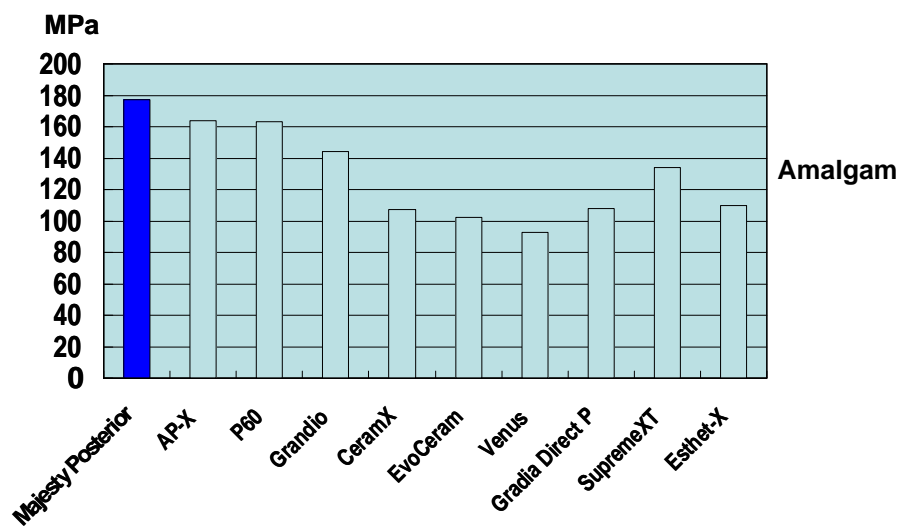
**Shades**



## Mechanical Properties

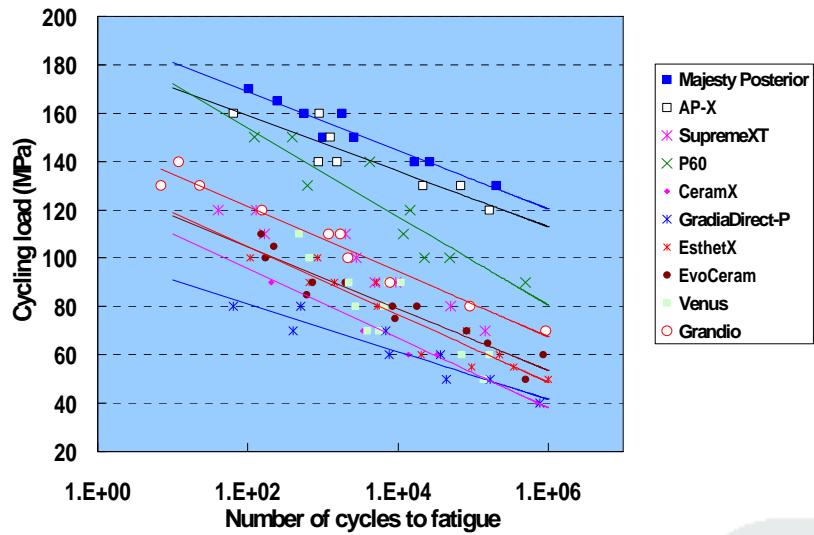
- **Strength**
  - ✓ Flexural Strength
  - ✓ Flexural Fatigue Resistance
  - ✓ Compressive Strength
  - ✓ Vickers Hardness
- **Marginal adaptation**
  - ✓ Volumetric Polymerization Shrinkage
  - ✓ Thermal Expansion Coefficient
  - ✓ Marginal Leakage
- **Wear Resistance**
  - ✓ Modified Leinfelder-type Wear

## Flexural Strength



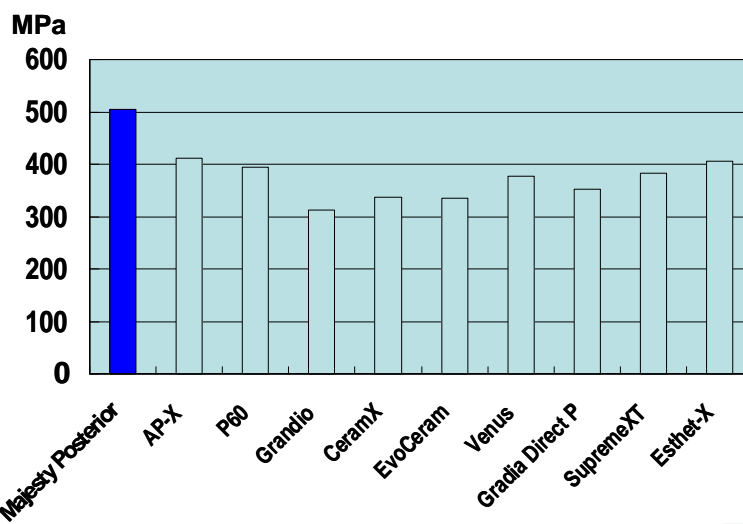
Source: Kuraray Medical Inc., Japan

### Flexural Fatigue Resistance



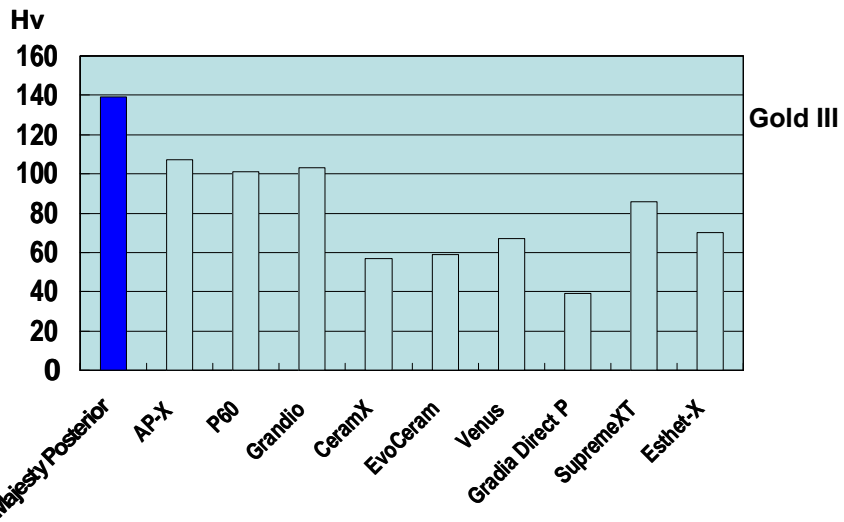
Source:Kuraray Medical Inc., Japan

### Compressive Strength



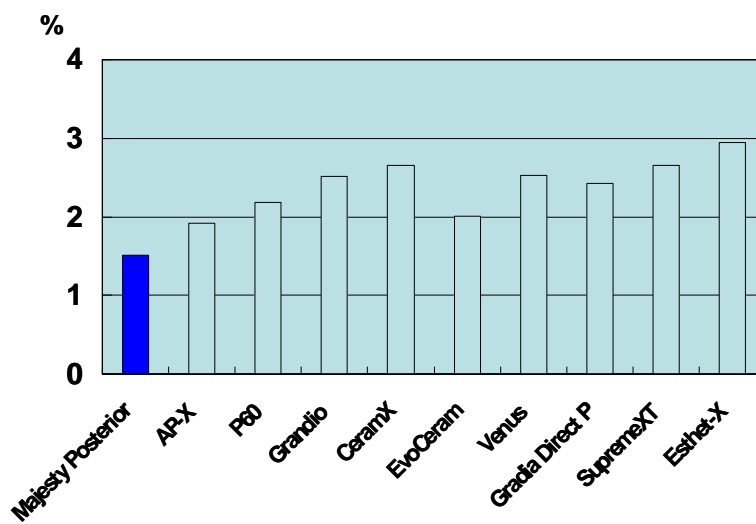
Source:Kuraray Medical Inc., Japan

### Vickers Hardness



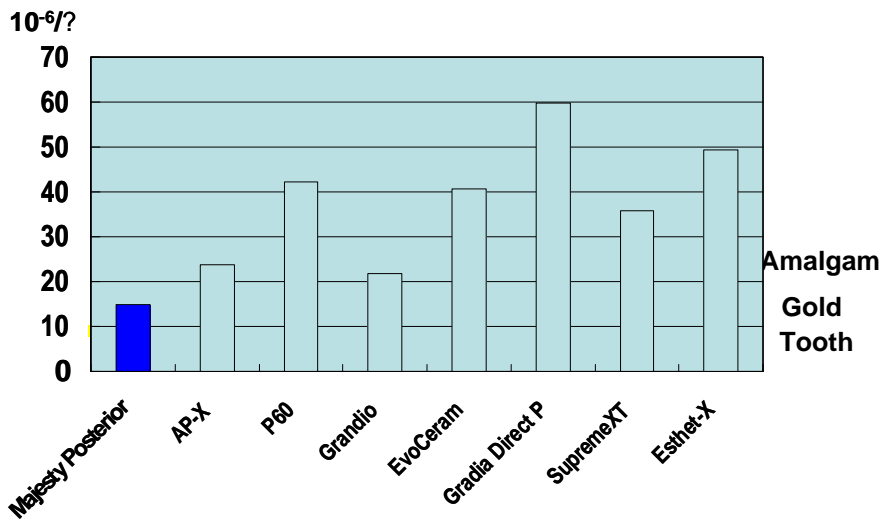
Source: Kuraray Medical Inc., Japan

### Volumetric Polymerization Shrinkage



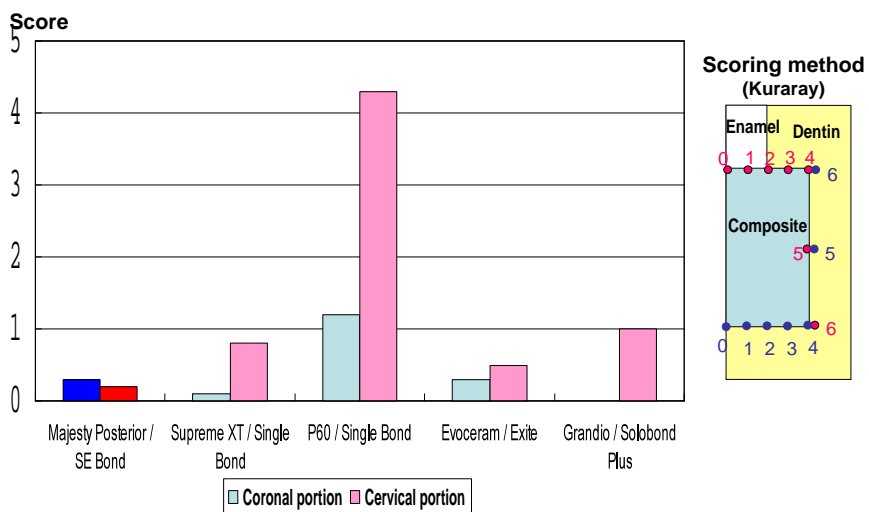
Source: Kuraray Medical Inc., Japan

### Thermal Expansion Coefficient



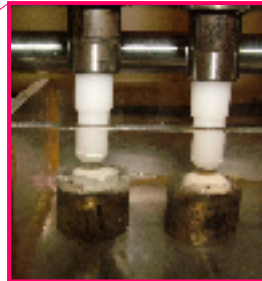
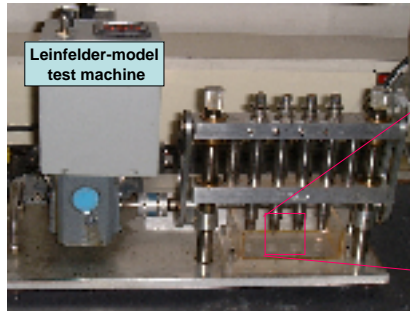
Source: JFE Techno-Research Corp., Japan

### Marginal Adaptation



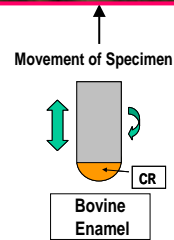
Source: Kuraray Medical Inc., Japan

## Modified Leinfelder-type Wear Test

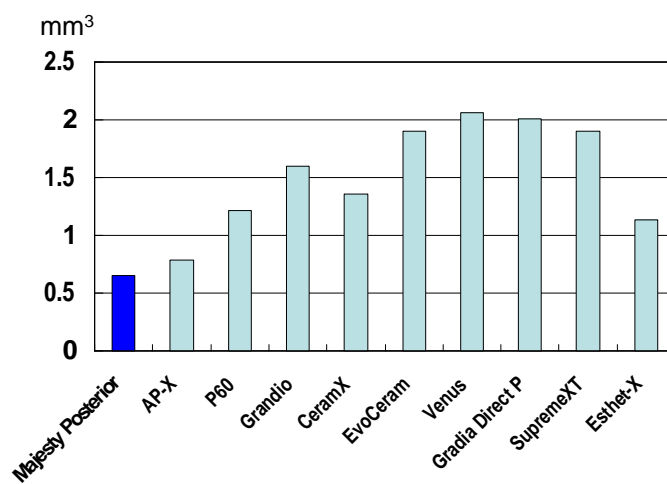


< Test Condition >

- Load: 15.6kg/cm<sup>2</sup>
- Repetition: 100,000times
- Circumstance: in Water at room temp.
- Diameter of Composite: 9.5mm
- Surface polish: Bovine enamel(#1000wet), CR(#3000dry)
- Amount(CR): Volume from weight change

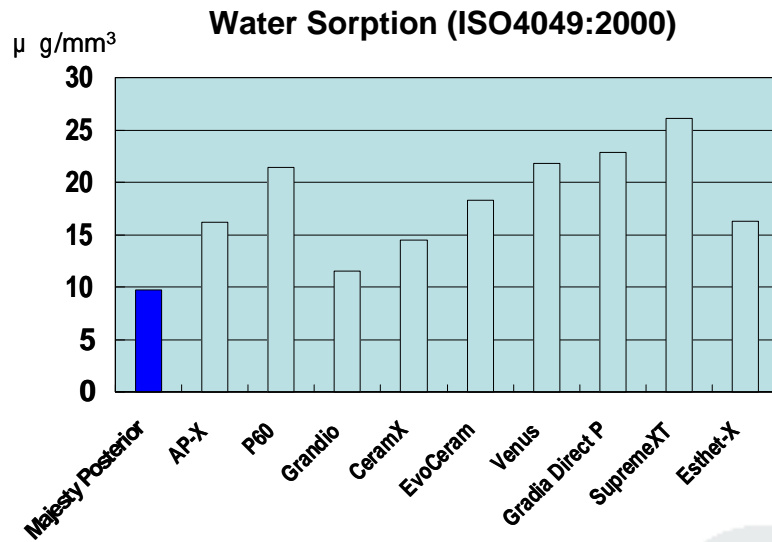


## Modified Leinfelder-type Wear



Source: Kuraray Medical Inc., Japan

## Water Resistance



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## Summary of Majesty Posterior

### Strength

- Flexural strength : 177MPa
- Flexural modulus : 22GPa
- Compressive strength : 504MPa

### Marginal adaptation

- Polymerization shrinkage : 1.5%
- Marginal Leakage : 0.3 (Coronal)  
(Score:Kuraray method) : 0.2 (Cervical)

### Wear Resistance

- Vickers hardness : 139 (Hv)
- Modified Leinfelder-type wear : 0.65mm<sup>3</sup> (Composite)

### Radiopacity

: 250% of Aluminum

### Water Resistance

: 9.7  $\mu\text{ g/mm}^3$ (Absorption)

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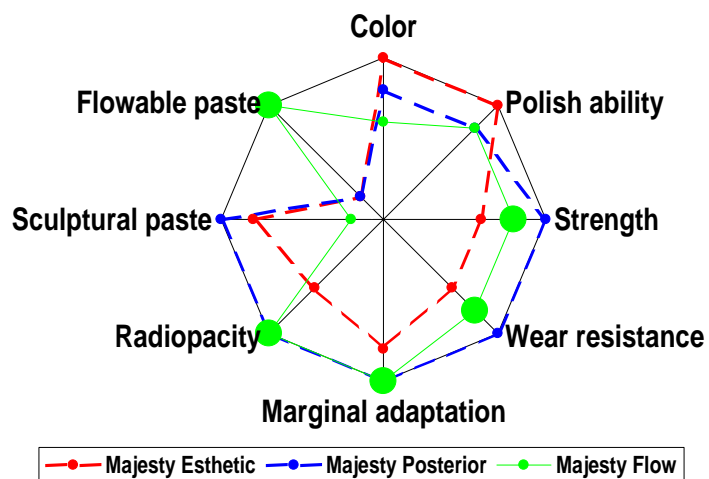
## Clearfil Majesty Flow (Flowable composite resin)



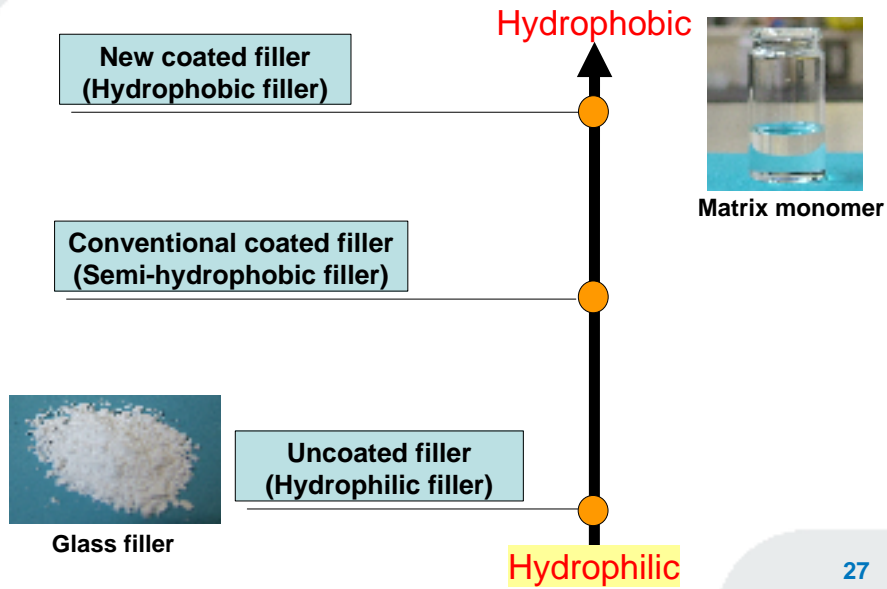
*Flowable Superfilled Hybrid Composite Mechanically Reliable  
Flowable type CR for Universal Use*



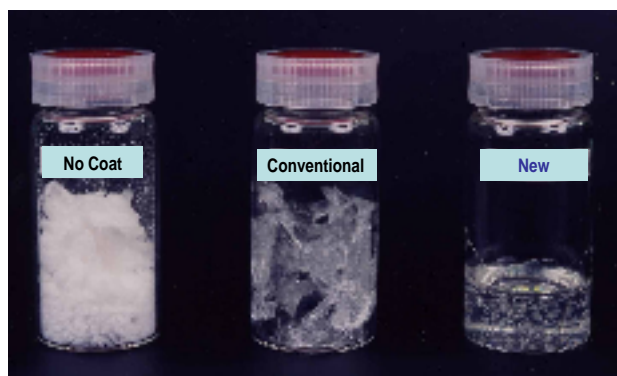
## Concept of Majesty Flow



### Wetability between Filler and Monomer



### Hydrophobic Coated Filler



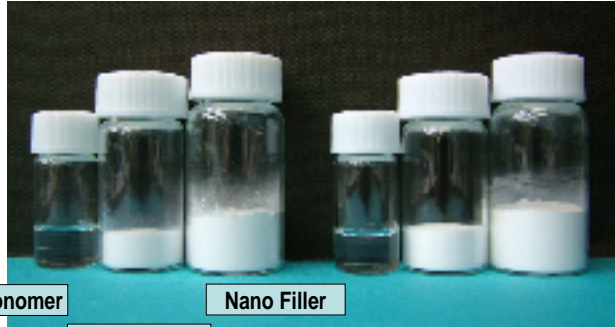
No Coat

Conventional Coat

New Hydrophobic Coat

Filler : SiO<sub>2</sub>  
Monomer : Bis-GMA/TEGDMA

### Filler Content for Majesty Flow



Matrix Monomer

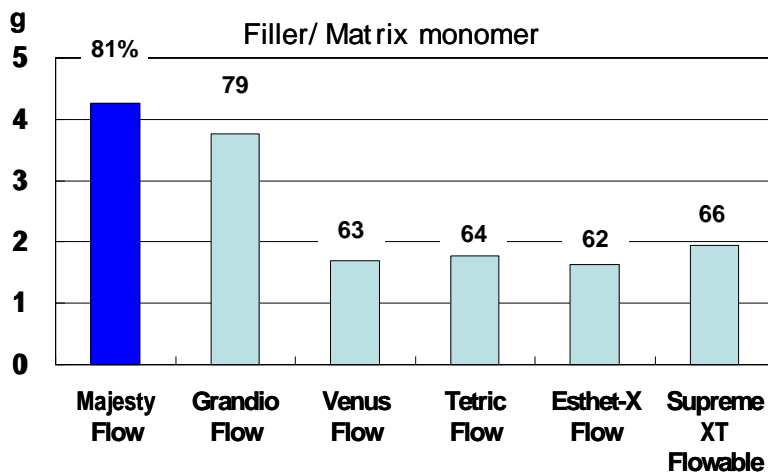
Nano Filler

Micro Filler

**Majesty Flow  
(FC:81wt%)**

**AP-X  
(FC:85wt%)**

### Filler Content (wt%)



Source:Kuraray Medical Inc., Japan

## Principal Ingredients

**Fillers : 81 wt% (62 vol%)**

- Silanated barium glass powder : 3.0  $\mu\text{m}$  (average)
- Silanated colloidal silica : 20 nm (average)

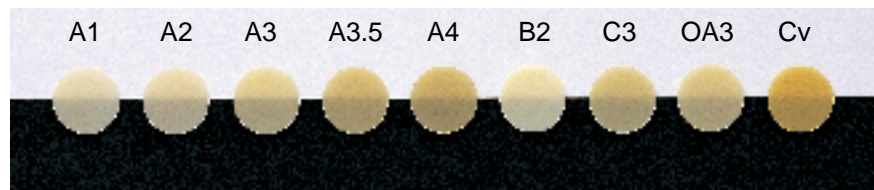
**Monomer : 19 wt%**

- Hydrophobic aromatic dimethacrylate
- Trietheneglycol dimethacrylate (TEGDMA)
- dl-Camphorquinone
- others

**Shades (9 shades) : A1, A2, A3, A3.5, A4,  
B2, C3, OA3, Cv(Cervical)**

## List of Shades

**Shades**



Cv : Cervical

## Mechanical Properties

### ➤ Strength

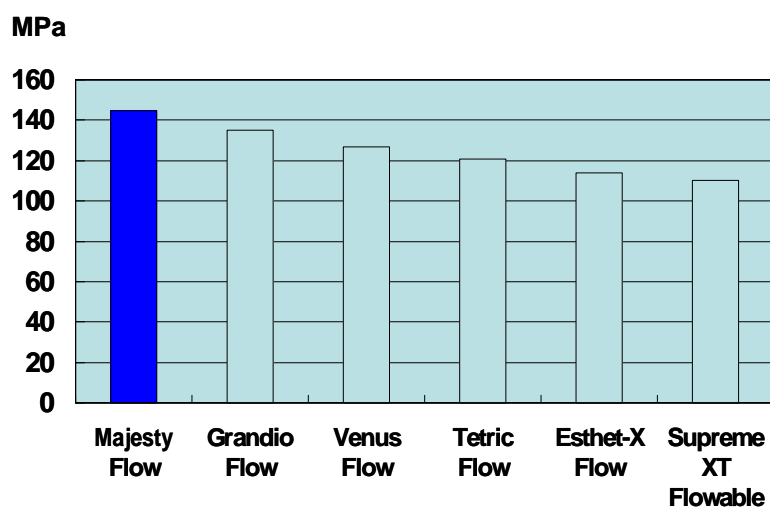
- ✓ Flexural Strength
- ✓ Flexural Fatigue Resistance

### ➤ Wear Resistance

- ✓ Modified Leinfelder-type Wear

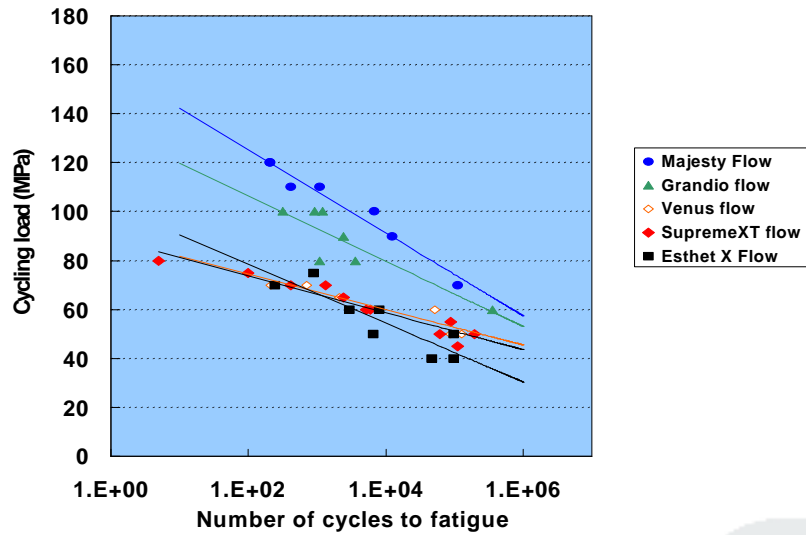
### ➤ Radiopacity

## Flexural Strength



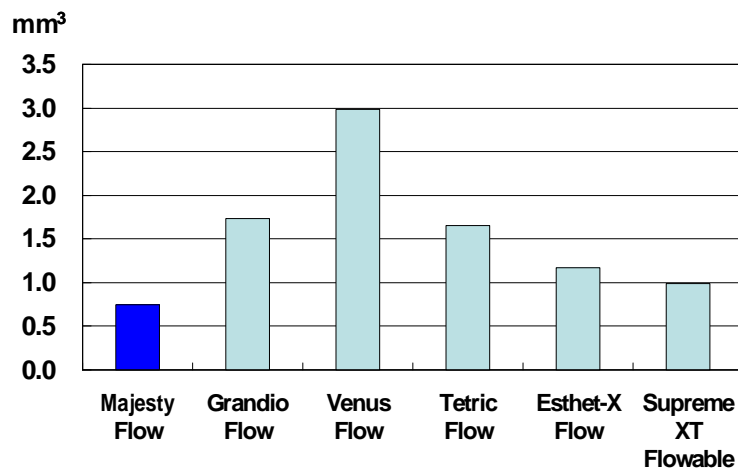
Source: Kuraray Medical Inc., Japan

### Flexural Fatigue Resistance



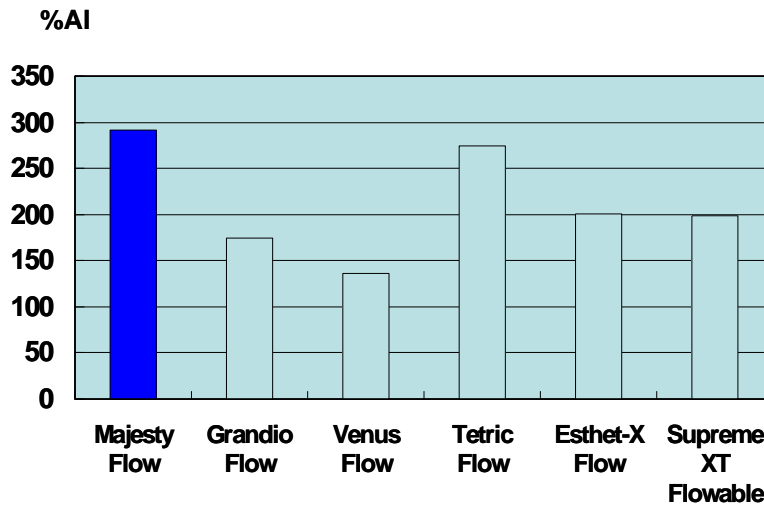
Source:Kuraray Medical Inc., Japan

### Modified Leinfelder-type Wear



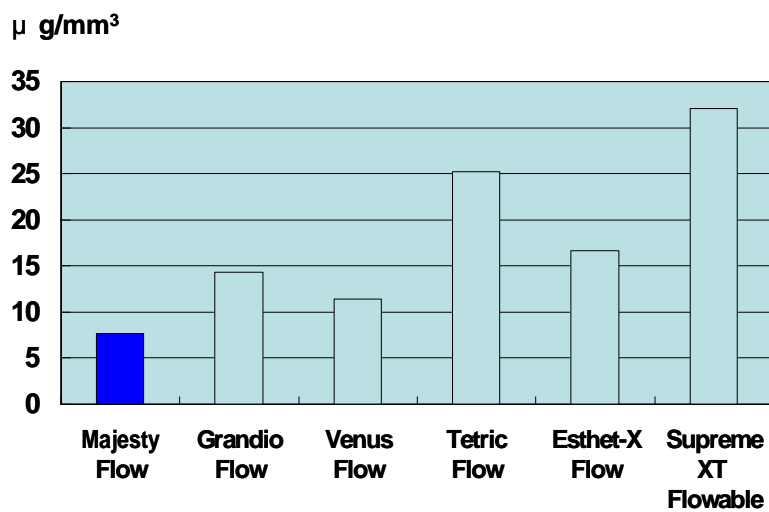
Source:Kuraray Medical Inc., Japan

### Radiopacity



Source: Kuraray Medical Inc., Japan

### Water Resistance



## Handling Properties

- **Non-sticky Dispensing**
- **Thinner Nozzle**

## Non-sticky Dispensing

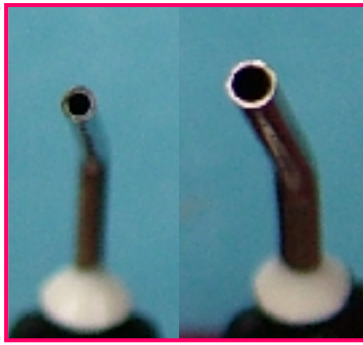


**Majesty Flow**



**Tetric EvoFlow**

### Thinner Nozzle



**Majesty Flow  
Flow**

Bore: 0.56mm

**Tetric**

0.82mm

### Handling Property for Clinical Cases

✓ **Lining**



✓ **Class V or Other Small Cavities**



## Summary of Majesty Flow

### Strength

- Flexural Strength : 145MPa
- Flexural Modulus : 10.5GPa

Wear Resistance : 0.75mm<sup>3</sup> (Composite)

Radiopacity : 290% of Aluminum

Water Resistance : 7.7μ g/mm<sup>3</sup>(Absorption)

Handling : Non-sticky dispensing

***Thank you for your Attention !***