

CLEARFIL MAJESTY:

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"The Avante-Garde Nano-SuperFilled Composite Resin"

Dr. Clarence P. Tam, HBSc, DDS



Dr. Clarence Tam, HBSc, DDS
Cosmetic and General Dentistry
Chairperson of New Zealand
Academy of Cosmetic Dentistry
www.nzacd.co.nz

It is safe to say that the spotlight of technological progress in dental restorative materials recently has shone brightly on composite resins. Improvements include advances in material handling, aesthetic chameleon effect in anterior resin composites and increased durability (wear resistance and strength), pertinent to posterior teeth. Greater reliability of both enamel and dentine bonding systems have also contributed to the overall expected lifetime of composites. In addition to providing the patient with a conservative and durable restorative solution, we are now able to foster aesthetic creativity that rivals that of bonded porcelain.

Background

Currently, the filler loading average in most composites is in the 80wt% region. A certain degree of design creativity must be applied to gain an acceptable product that exhibits ideal translucency, polishability, strength, radiopacity, good handling characteristics and low polymerisation shrinkage. These factors are modified and optimised by Clearfil by looking at three factors: Monomer composition, surface treatments and inorganic fillers.

Polishability increases as the filler particle size decreases. Weak binding between filler and matrix causes debonding, leading to surface irregularities that increase rate of abrasion and decrease polish retention.

Strength is improved by maximising the density of filler in the composite resin. Using a novel surface treatment technique developed by Okada et. al (IADR, 1997), the volume of liquid remains minimal, whilst the filler loading percentage is maximised.

Low polymerisation shrinkage can be improved by increasing the filler loading content from the average of 80wt% to greater than 85wt% (Majesty Posterior). Other companies have also achieved this by using different techniques, such as the opening of monomer ring configurations during polymerisation (i.e. silorane, oxyrane and spiro-orthocarbonate). However, these monomers cannot use conventional bonding agents, since they set via cationic polymerisation, as opposed to conventional materials, which use radical polymerisation. The Clearfil Majesty range is able to use conventional bonding systems, minimising the need for additional materials in your daily armamentarium.

Chameleon Effect

Is the ability of a material to take on the optical surface textural characteristics of its neighboring physical structures. In so doing, a material appears invisible and undetectable. Fluorescence is also a prerequisite.

Clearfil Majesty used the research of Dr. Inokoshi, in which it was found that in order to gain chameleon effect, a combination of minimising total transparency and increasing light diffusion in a way that opaque composites cannot achieve was necessary. He looked at marrying different types of matrix monomer with filler. Good light diffusion was achieved when the filler had a certain

difference in light refraction index compared with the monomer matrix. Too close the difference, and the more transparent the composite. Too variant, and the composite loses all translucency. An ideal light diffusion for chameleon effect was found at a refractive index difference of 0.02. This allows for the unique chameleon effect of Clearfil Majesty Esthetic in anterior acid-etched composite restorations.

Strength and Durability: What we all wish for

Clearfil Majesty Posterior found a bonus in improving strength with a simultaneous decrease in polymerisation shrinkage. Using the aforementioned method of increasing filler content via a novel surface treatment ("Nano Dispersion Technology"), they were able to **increase the filler content to 92wt%** (average 80wt%)! This improved flexural strength to the 177MPa mark, and compressive strength to 504MPa. Volumetric polymerisation shrinkage was read at 1.5%! This is the lowest polymerisation shrinkage and the benchmark for all dimethacrylate monomer composite resins (i.e. REGULAR composites, not silorane or oxyrane-based). The thermal expansion co-efficient (15.0×10^{-6}) approximates that of tooth structure (biased towards enamel, but between enamel and dentine). It is important to note that the increased hydrophobicity of the new matrix monomer (changed from Bis-GMA/TEGDMA) reduces the water sorption of the hardened composite significantly from 16.2µg/mm³ (Clearfil AP-X old reference) to 9.72µg/mm³.

Clearfil Majesty Flow is a new benchmark in flowable composites. Featuring virtually zero-slump, the filler loading has also been increased from the market average of 62wt% to 81wt%. Linear polymerisation is down to 1.9%, significantly lower than other flowable composites. To boot, there is a new hydraulic control system in the flowable syringe; immediately stopping composite flow in the absence of pressure and thus minimising material wastage as commonly seen.

Critical Numbers

Majesty Esthetic: "Optical Tooth Mimetic"

Indications: single shade anterior AND posterior restorations (universal application), possible through optimal light diffusion, blocking out dark shadows in "through-and-through" Class III, IV and V restorations.

Volumetric polymerisation shrinkage: 1.9%

Majesty Posterior: filler particle loading maximised through "Nano Dispersion Technology" monomer surface treatment.

Indications: posterior Class I, II and V restorations as well as direct complex composite onlays. Single shade restoration possible through ideal light diffusion technology.

Volumetric polymerisation shrinkage: 1.5%

Majesty Flow: "no-slump, no waste application"

Indications: floor or wall lining of restorations, small anterior Class V cavities.

Linear polymerisation shrinkage: 1.9%

