

Review

Single-Shade Universal Composites in Restorative Dentistry: A Review of Omnichroma

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Abstract:

The emergence of single-shade universal resin composites marks a paradigm shift in restorative dentistry, simplifying the complex and error-prone process of colour matching. OMNICHROMA (Tokuyama Dental) is the foremost product in this category, employing a sophisticated "Smart Chromatic Technology" based on structural colouration rather than traditional pigment inclusion. This comprehensive review synthesizes recent *in vitro* and clinical evidence, focusing on OMNICHROMA's unique mechanism, optical performance, clinical efficacy, and physical properties, including surface roughness and repair bond strength. Literature confirms OMNICHROMA's superior blending effect, leading to excellent visual colour matching across the VITA classical range, often comparable to dedicated multi-shade composites. While instrumental colour measurements sometimes exceed perceptibility thresholds for specific optimal shades, the material's strong chameleon effect ensures high visual acceptability and patient satisfaction, confirming its clinical reliability in both anterior and posterior restorations. Furthermore, OMNICHROMA demonstrates comparable resistance to aging effects and successful reparability when appropriate surface conditioning is utilized, solidifying its position as a reliable, time-saving aesthetic solution.

Keywords: OMNICHROMA, Tokuyama Dental, Restorative Dentistry

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1. Introduction: The Persistent Challenge of Shade Matching

Since their introduction into restorative dentistry, composite resins have become the material of choice for both anterior and posterior restorations owing to their favourable optical properties.^{3,11} Recent advancements in material science have focused on enhancing their biomimetic potential by improving shade reproduction, translucency, and surface morphology, while ensuring long-term colour stability. Nevertheless, despite these developments, challenges such as colour mismatch and discolouration remain prevalent, often

compromising esthetic outcomes and necessitating the replacement of restorations.¹⁻¹²

Achieving a seamless integration between a resin composite restoration and the adjacent natural tooth structure continues to be one of the most demanding aspects of direct restorative dentistry.⁴ Conventional composite systems require clinicians to maintain an extensive range of shades (e.g., A1, A2, A3, B1) and frequently rely on complex multi-layering techniques to reproduce the inherent colour, opacity, and chromaticity of natural dentition. This approach is technique-sensitive, time-consuming, and

susceptible to visual inaccuracies, which may adversely affect the final esthetic result.²

To address these limitations, Tokuyama Dental introduced the “Wide Colour Matching” concept to improve shade-matching precision and versatility in restorative dentistry.³ These composite materials are designed to blend with a broad spectrum of natural tooth colours, thereby enhancing clinical efficiency and reducing chairside time required for shade selection. OMNICHROMA is a novel resin composite that incorporates advanced colour-matching technology, enabling shade adaptation to the surrounding tooth structure through a unique chromatic adaptation mechanism.¹³

The advent of single-shade universal composites, such as OMNICHROMA (OM), aims to overcome the logistical and technical challenges associated with conventional composite systems.¹ By providing a single universal material capable of adapting to all VITA classical shades (A1–D4), this technology has been reported to exert a significant impact on esthetic restorative dentistry by simplifying clinical protocols and substantially reducing the need for shade selection.^{1,2}

2. Mechanism of Colour Adjustment: Structural Colouration

The foundational distinction of OMNICHROMA lies in its **Smart Chromatic Technology**, which utilizes a physical principle known as **structural colouration**, differing fundamentally from the chemical colouration achieved by conventional pigments or dyes.^{2,4}

The composite matrix incorporates uniformly sized, **spherical silica fillers** measuring approximately 260 nm in diameter.⁴ This specific dimension and uniform arrangement are critical. When visible light interacts with these microstructures, the phenomenon of **light scattering** occurs.² Instead of absorbing or reflecting a set colour, the fillers scatter light across the visible spectrum. When placed adjacent to a tooth, the fillers preferentially reflect the specific light wavelengths being emitted by the surrounding natural tooth structure, causing the material to visually assimilate the hue, chroma, and value of the adjacent environment. The raw material itself is typically described as a slightly opaque white or single, non-VITA-defined colour.⁴

For instances requiring increased opacity, such as deep Class I or Class II cavities, or cases with severe underlying discolouration, OMNICHROMA

Blocker, a supplementary opaque material, is recommended to prevent the restorative material from transmitting (showing through) the colour of the dark tooth structure beneath it.⁴

3. Optical Performance and Clinical Efficacy

The clinical effectiveness of OMNICHROMA is primarily evaluated through both subjective (visual) and objective (instrumental) colour analysis.

3.1. Visual and Instrumental Colour Matching

Comparative studies have rigorously tested OMNICHROMA against established multi-shade conventional composites, such as 3M Filtek Z350.³

- **Visual Assessment:** Evaluations performed by trained dental observers and even non-dental personnel consistently show that OMNICHROMA achieves **excellent visual colour matching**.² In one study, visual assessments found no significant difference in colour matching between OMNICHROMA and various optimal shades (A3, A3.5, and B2) of a control composite.³ Case reports detailing restorations in Class III, Class V, fractured teeth, and midline diastema closures corroborate these findings, reporting high patient acceptability and aesthetic success based on visual criteria.^{2,4,9} Assessments using the Modified US Public Health Services (USPHS) Ryge Criteria have also graded the aesthetic outcome as successful.²
- **Instrumental Assessment:** Instrumental analysis, typically using a spectrophotometer designed to calculate CIE Lab values for 2° observation under a D65 illumination curve, offers an objective measure of colour difference.^{3,5} While OMNICHROMA showed values comparable to an A3 control shade, it exhibited statistically higher values when compared to the **optimal shades** (A3.5 and B2) selected for certain substrates.³ This discrepancy between instrumental and visual results highlights the crucial role of the **blending effect** (chameleon effect) inherent to structural colouration. The scattering of light blurs the colour boundary, meaning that even if the measured colour difference exceeds the

typical clinical perceptibility threshold, the **visual perception of the mismatch remains acceptable** to the human eye, thereby confirming its clinical suitability.³ Further research on optical properties confirms that its unique light interaction facilitates this effective colour adjustment.⁵

3.2. Clinical Application and Versatility

OMNICHROMA's single-shade capability simplifies its application across various clinical scenarios:

- **Anterior Restorations:** OMNICHROMA has been successfully documented in handling complex anterior aesthetic challenges, including restorations of fractured teeth, closure of midline diastema, and masking discoloration from conditions like fluorosis.⁴
- **Posterior Restorations:** Its application is not limited to aesthetics. Studies evaluating OMNICHROMA in posterior areas, using simulated clinical cavities (Class I restorations), have demonstrated satisfactory colour matching capability even in areas less dependent on the chameleon effect, affirming its potential as a true universal restorative material.⁸ It has also been evaluated for use in Non-Carious Cervical Lesions (NCCLs)/abfraction lesions.^{9,10}

4. Physical and Mechanical Characteristics

The clinical longevity of a composite material requires robust physical properties, particularly resistance to degradation and the ability to be repaired successfully.

4.1. Surface Roughness and Aging Stability

The oral environment subjects restorations to mechanical wear, thermal cycling, and chemical degradation from various beverages.^{6,11} An *in vitro* study simulating one year of clinical aging (immersion in distilled water, tea, coffee, or wine, followed by brushing and thermal cycling) assessed the surface roughness of OMNICHROMA and its flowable variant, OMNICHROMA Flow, against other conventional and flowable composites.⁶

- **Effect of Aging:** The study demonstrated that while the surface roughness of

OMNICHROMA was affected by the artificial aging procedures, the changes were comparable to those observed in other modern nanohybrid and bulk-fill composites.⁶ This suggests that the unique filler technology does not detrimentally compromise the material's resistance to surface degradation in comparison to established multi-shade brands.

4.2. Repair Bond Strength and Conditioning

Successful repair is vital for extending the lifespan of composite restorations. Research comparing the shear bond strength of OMNICHROMA and Charisma Diamond ONE when bonded to aged composite substrates (IPS Empress Direct Enamel and OptiShade) underscores the importance of proper surface preparation.⁷

- **Surface Conditioning:** The repair bond strength was significantly influenced by the substrate material and the chosen surface treatment method.⁷ Both **air particle abrasion (APA)** and **silicon carbide grinding (SiCr)**, followed by phosphoric acid etching and adhesive application, were investigated.⁷ Although bond strength varied across different groups, the results collectively emphasize that OMNICHROMA, like other composites, requires meticulous adherence to surface conditioning protocols to ensure a durable and reliable bond when repairing an existing restoration.⁷

5. Conclusion

OMNICHROMA's introduction heralds a new era for direct restorations, effectively merging simplicity and aesthetics through structural colouration. Current evidence overwhelmingly validates its clinical use by demonstrating a powerful blending effect that ensures excellent visual colour match across the entire VITA range, simplifying the clinician's workflow and enhancing patient satisfaction. While instrumental values may offer a conservative view, clinical acceptability remains high. Future research should prioritize long-term, randomized controlled clinical trials to fully establish the *in vivo* longevity, colour stability, and wear resistance of this innovative single-shade universal composite.

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