



Title	Evaluation of shade matching of a novel supra-nano filled esthetic resin composite employing structural color using simplified simulated clinical cavities [an abstract of dissertation and a summary of dissertation review]
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学位論文内容の要旨

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学 位 論 文 題 名

Evaluation of shade matching of a novel supra-nano filled esthetic resin composite employing structural color using simplified simulated clinical cavities

(臨床を想定した単純窩洞に構造色を用いた新規スープラナノフィラー含有コンポジットレジンの色差測定評価)

キーワード: Shade matching, Esthetic resin restoration, Resin composite, Structural color, Filler morphology

The evolution of adhesive dentistry and patients' esthetic demands have made resin composite the most used restorative material in current dental practice. The use of the recently introduced universal-shade resin composites, which are expected to match nearly all shades, simplifies the restorative procedure, therefore raising interest among clinicians.

This study was to evaluate the shade matching ability of a novel supra-nano filled esthetic resin composite employing structural color technology using simplified simulated clinical cavities. Filler morphology and light transmittance characteristics were also evaluated.

One-hundred and twenty frames of resin composite were built in A1, A2, A3, and A4 shades to simulate Class I cavities (diameter = 4 mm, height = 2 mm). For each shaded frame, cavities were filled with three different types of filler containing

resin composites (n = 10): supra-nano filled (SN filled) resin composite, micro-hybrid filled (MH filled) resin composite, and clustered-nano filled (CN filled) resin composite. Color parameters were calculated using CIELAB (ΔE_{ab}) and CIEDE2000 (ΔE_{00}). Data were analyzed using one-way ANOVA, followed by Duncan's test ($\alpha = .05$). Five representative discs (diameter = 4 mm, thickness = 1 mm) of each tested filler containing resin composite were prepared for measure the light transmittance characteristics. For each disc, the two-dimensional distribution graph of transmitted light intensity was determined under regulated conditions. Filler morphologies of three tested filler containing resin composites, and ESQ resin composite were observed under SEM. The resin matrix was dissolved with acetone. The specimens were then rinsed with water and air-dried for 5 s. The filler morphologies were examined at $\times 10,000$ and $\times 20,000$ magnifications.

Duncan's post hoc test revealed that both ΔE_{ab} and ΔE_{00} of SN filled group was significantly lower than that of MH and CN filled groups in the cases of A2, A3, and A4 shades ($P < .05$), while ΔE_{ab} and ΔE_{00} of A1 shade of MH filled group was significantly lower than that of SN and CN filled groups ($P > .05$). The two-dimensional distribution graph of light transmittance characteristics of the tested resin composites revealed that MH filled group had a broader distribution of light transmission intensity than CN and SN filled groups. SN filled resin composite showed regularly distributed, spherical supra-nano filler particles with diameters of approximately 260 nm. The fillers were clustered together in some areas.

From the results of this study, it might be concluded that the SN filled resin composite showed better shade matching with A2, A3, and A4 shades of resin composite frames compared to MH filled resin composite, and CN filled resin composite. Universal-shade resin composites, which were expected to match nearly all shades, simplifies the restorative procedure. Resin composite, which contained spherical supra-nano filler particles, could contribute most to its shade matching by stimulating structural color. Structural color technology may provide additional benefits for shade matching of resin composites.

