Evaluation of Biaxial Flexural Strength and Inorganic Composition of Simplified-shade Composites

Özge Duman[1] , Meriç Berkman[2], Mustafa Demirci[1] ,Safa Tuncer[1]

[1] İstanbul University, Department of Restorative Dentistry, Istanbul
[2] Bahçeşehir University, Department of Restorative Dentistry, Istanbul

Introduction: The present study aimed to characterize the inorganic composition and biaxial flexural strength of simplified-shade composites.

Materials and Methods: In this study six simplified-shade composites Omnichroma (Tokuyama, Japan), Vittra APS Unique (FGM,Brasil), Charisma Topaz (Diamond) One (Kulzer,Germany), OptiShade (Kerr Dental,USA), G-aenial A'Chord (GC Corp, Japan), Neo Spektra ST (Dentsply,USA) were evaluated. Approximately 1 g of unpolymerized composite was washed in 6 mL of acetone (99.5%,Zak Kimya, Turkey) and centrifuged (Silfradent, Italy) at 1000 rpm for 5 minutes. This procedure was repeated until the entire organic matrix was dissolved, as evidenced by clarity of the supernatant fluid. Chloroform (99.8%, Zag Kimya,Turkey) was then used in the same manner. The remaining content of fillers was then immersed in 6 mL of absolute ethanol (Zag Kimya,Turkey) for 24 hours followed by drying at 37C in an incubator. Filler particle composition and morphology were examined with energy-dispersive X-ray spectroscopy (EDX) and scanning electron microscopy(SEM), respectively. Flexural strength of the materials was tested with three-point bending test by using universal testing machine. One hundred bar-shaped composite specimens (n = 10) were prepared by placing them into a Teflon mold (25 mm length, 2 mm width, and 2 mm height) and polymerized with a light-curing device

Results: According to the three-point bending test results, the highest flexural strength values were obtained from Vittra APS Unique, and the lowest flexural strength values were obtained from Neo Spectra ST material (Fig.7). EDX tests showed that all composite materials contain high silica content. Charisma Diamond One, Vitra APS Unique, G-aenial A'Chord and Neo Spektra ST have high barium content.

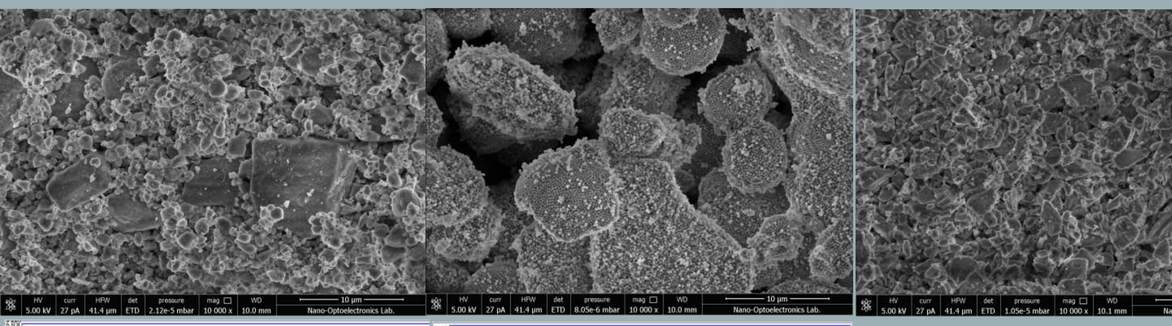

Fig.1 OptiShade

Fig.2 Omnichroma

Fig..3 Charisma (Diamond) Topaz One

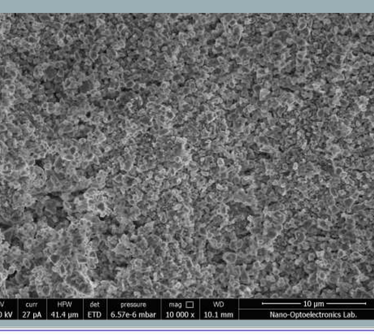

Fig.4 G-aenial A'Chord

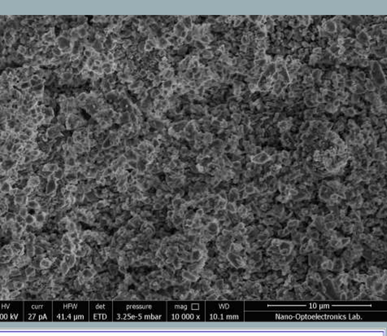

Fig.5 Neo Spektra ST

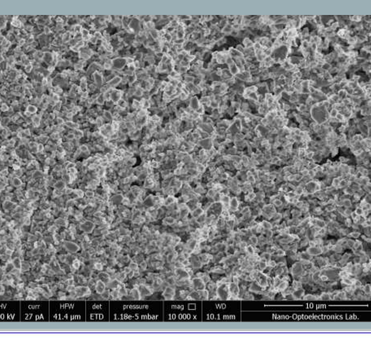

Fig.6 Vitra APS Unique

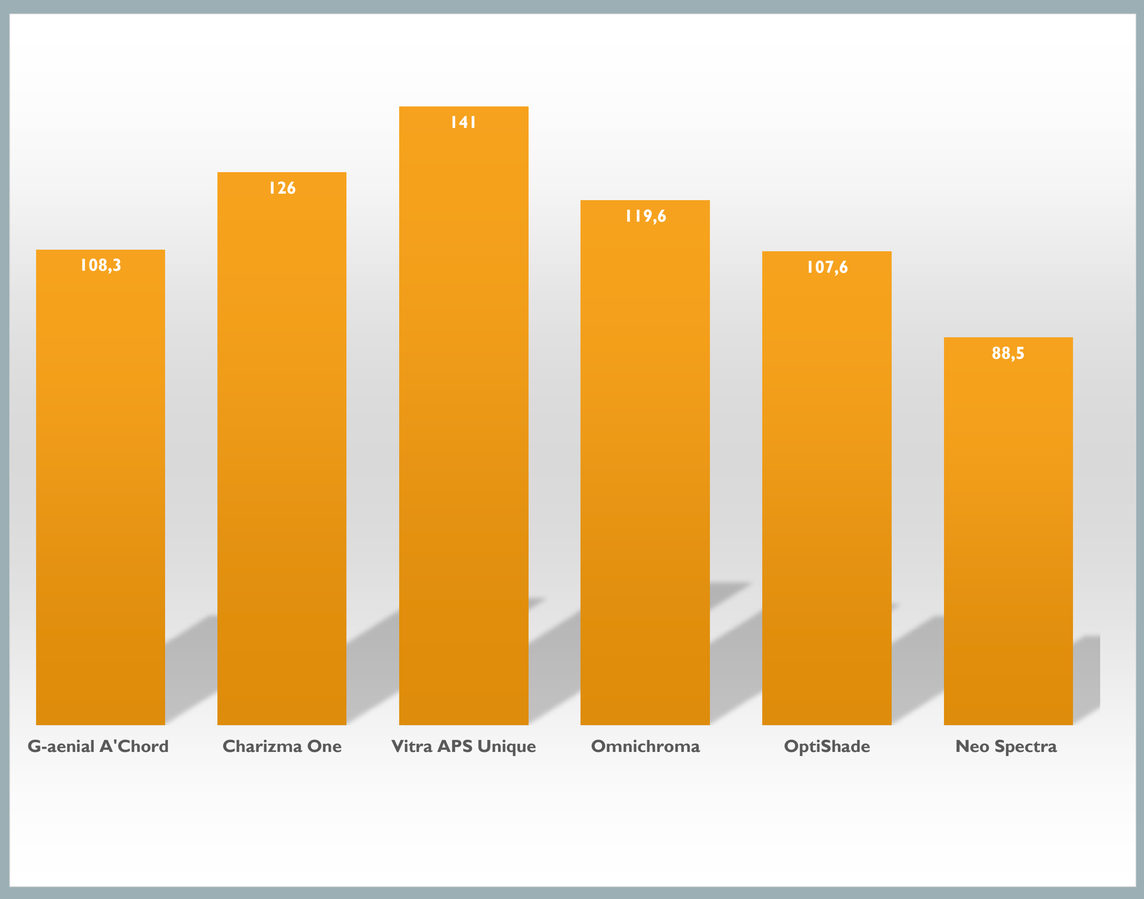

Fig.7 Flexural Strength Value (Mpa)-Composite Graph

Material, Manufacturer	Composite Structure	Filler w/V%
Omnichroma Tokuyama, Japan	Uniform sized supra-nano spherical filler (260 nm spherical SiO_2-ZrO_2) and CF UDMA TEGDMA	79/68
Vittra APS Unique FGM, Brasil	Zirconia charge, silica (200 nm) UDMA TEGDMA	82/72
Charisma Diamond One Kulzer, Germany	B2O3-F-Al2O3-SiO2, silica, TiO_2, fluorescent pigments, metallic oxide pigments, organic pigments, 5 nm–20 µm UDMATCD-DI-HEA TEGDMA	81/64
OptiShade Kerr Dental,USA	Pre-polimerized filler, BaO-Al2O3-SiO2, silica, and F_3Yb, organic fillers Smallest primary particle size: 5 nm, Largest primary particle size: 400 nm, average particle size: 50 nm Bis-EMA, Bis-GMA, TEGDMA	81/64.5
G aenial Achord GC, Tokyo, Japan	Glass-filler (barium glass) (fumed silica), Organic filler (barium glass; fumed silica). Bis-MEPP,	82/65
Neo Spectra ST Dentsply, Konstanz, German	Spherical, pre-polymerized SphereTEC® fillers, non-agglomerated barium glass and ytterbium lüoride. Highly dispersed, methacrylic polysiloxane nano-particles in resin matrix	79/61

Fig.8 The brand names, manufacturers, monomers, filler types, and filler loadings of the composites.

Conclusion: Vittra APS Unique and Charisma Diomond One have high flexural strength due to their high filler content. Despite Neo Spectra ST's high filler content, low flexural strength was observed due to its pre-polymerized filler content (Fig.8).

Funding/conflict of nterest: The present work was supported by Scientific Research Projects Coordination Unit of Istanbul University. Project Number: 38034