



0328

Effects of Vacuum Sintering on 3Y, 4Y and 5Y Zirconias

J. Tsoi, Y. Lee, H. Ding, D. Cho

The University of Hong Kong, Sai Ying Pun, Hong Kong

Objectives This study aims to investigate the mechanical and aesthetic properties of 3Y, 4Y and 5Y zirconia in A3 shade using traditional and vacuum sintering furnaces.

Methods A total 135 samples of 3Y, 4Y and 5Y zirconia in A3 shade (Explore Esthetic, Upcera, China) (n=45) were sectioned in size of $\sim\varnothing 20\text{mm} \times 1.3\text{mm}$. Then, these samples were cleaned and polished with 200- and 1000-grits SiC abrasive water under deionised water. After 1 day of drying, 15 samples of each zirconia were randomly allocated to two sintering furnances, traditional (Zyrcomat 6000MS, VITA) and vacuum (CS6, Ivoclar) using three sintering programme: S1) 64 mins for vacuum sintering heated to 1560°C; S2) 74 mins for vacuum sintering heated to 1560°C ; and S3) 7h 29 mins heated to 1550°C for traditional sintering. Colour parameters of ΔE , ΔL , Δa , Δb (Colourimeter, Nix Pro 2), surface roughness (AFM, Bruker's EDGE), surface gloss (Glossmeter, WG45) and biaxial axial strength σ_{BFS} (Universal Testing Maching, Instron E3000, following ISO 6872:2015) were evaluated on all sintered samples. The significant level was pre-set as 0.05 for all statistical tests.

Results In terms of colour parameters, two-way ANOVA revealed that, while ΔE , ΔL , Δa and Δb are significantly different on zirconia types ($p < 0.001$), sintering programmes are significantly different on a ($p = 0.002$), ΔE and L ($p < 0.001$) but not b ($p = 0.071$). Compared to S3, all ΔE , ΔL , Δa and Δb are significantly higher in S1 than S2 for all zirconias, except for ΔL for 4Y that has no difference ($p = 0.50$). In terms of glossiness, the type of zirconia ($5Y > 4Y > 3Y$, $p < 0.001$) and sintering programme ($S3 > S2 > S1$, $p < 0.001$) have a significant difference. In terms of roughness, only sintering program ($S1 < S2 = S3$, $p < 0.001$) has shown a significance. For σ_{BFS} , both zirconia ($3Y > 4Y = 5Y$, $p = 0.01$) and sintering programme ($S3 > S2 = S1$, $p < 0.001$) have shown a statistical significance.

Conclusions Vacuum sintering S1 and S2 have substantial impact on the mechanical and aesthetics properties on 3Y, 4Y and 5Y zirconia.