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Improving Bond Strength And Thermal Behaviour Of New Sodalite Infiltrate Ceramic Core Materials

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Introduction: The mismatch in coefficient of thermal expansion (CTE) between the veneered porcelain and the ceramic core has been primarily identified as the cause of core/veneer chipping in all-ceramic restorations. This study aimed to evaluate the effect of sodalite infiltration on the CTE behaviour and bond strength of different all-ceramic prostheses. **Materials and Methods:** The experimental groups were synthesised sodalite-infiltrated alumina (IA-SOD) and synthesised sodalite-infiltrated zirconia-toughened alumina (ZTA) (IZ-SOD), while the control groups were glass-infiltrated alumina (IA-glass) and glass-infiltrated ZTA (IZ-glass). Forty cylindrical-shaped samples (5mm diameter; 10mm height) were tested for CTE. Another forty disc-shaped samples (12mm diameter; 1.2±0.2mm thick) and veneered with cylinder-shaped low-fusing porcelain (2mm high; 2mm diameter) were prepared for shear bond strength test. SEM, stereo microscope and AFM were used to investigate the structural characteristics of samples at the fracture surface. **Results:** The CTE values for both IZ-SOD and IA-SOD were 8.62 x 10^{-6} K^{-1} and 8.37 x 10^{-6} K^{-1} respectively, which were statistically higher than IZ-glass and IA-glass (8.08 x 10^{-6} K^{-1} and 7.63 x 10^{-6} K^{-1}, respectively) ($p<0.05$). The shear bond strengths for both IZ-SOD and IA-SOD (26.83 MPa and 24.91 MPa respectively) were also statistically higher than IZ-glass and IA-glass samples (23.81 MPa and 18.37 MPa, respectively) ($p<0.05$). However, there was no significant difference in CTE and bond strength among IZ-SOD, IA-SOD and IZ-glass samples ($p>0.05$). **Conclusion(s):** The higher CTE mismatch and bond strength of the newly developed SOD-infiltrated samples than did the commercial glass-infiltrated samples could thus make them suitable for all-ceramic dental prostheses.

KEYWORDS: sodalite infiltrates, shear bond strength, CTE mismatch, alumina, zirconia-toughened alumina