42 Characterization of a Full-Contour-Zirconia and Glaze Application Strategy

Wednesday, March 20, 2013: 1:30 p.m. - 3 p.m.
Location: Room 610 (Washington State Convention Center)
Presentation Type: Oral Session

S.A. FEITOSA[1], *W.K. YOSHITO SR.*[2], *D. LAZAR*[3], *V. USSUI*[3], *Í.E.L. VIANA SR.*[4], *L.F. VALANDRO*[5], *M.C. BOTTINO*[6], *and M.A. BOTTINO*[7], [1]*Universidade Est. Paulista Julio Mesquita, Sao Jose dos Campos, Brazil,* [2]*Materials Science and Technology Center, Nuclear and Energy Research Institute, IPEN-CNEN/SP, São Paulo, Brazil,* [3]*Instituto de Pesquisa Nuclear, São Paulo, Brazil,* [4]*Universidade Est. Paulista Julio Mesquita, São José dos Campos, Brazil,* [5]*Restorative Dentistry, Federal University of Santa Maria, Santa Maria, Brazil,* [6]*Division of Dental Biomaterials, Indiana University School of Dentistry, Indianapolis, IN,* [7]*Dental Materials and Prosthodontics, UNESP - Univ Estadual Paulista, Sao Paulo, Brazil*

Objective: To characterize some physico-chemical and mechanical properties of a new full-contour zirconia (FCZ, Diazir, Ivoclar-Vivadent). Additionally, a modified glaze (MG) material, and the feasibility of a novel glaze application technique, to standardize the thickness and homogeneity of a glaze coating on the intaglio surface aiming to improve the bond strength to resin cements, were also investigated.

Method: FCZ apparent density and porosity were obtained using the principle of Archimedes. Vickers hardness and fracture toughness (K_{IC}) were determined by the indentation method. Scanning electron microscopy/SEM was used to study the ceramic microstructure, and X-ray diffraction/XRD to characterize the phases present. The viscosity of a traditional glaze suspension was modified with the aid of a solvent, thus allowing the use of the airbrush technique. MG viscosity was determined using a rheometer. The MG particle size was measured using the electrophoretic mobility technique. The groups were divided according to the glaze application technique used: B-Brush (conventional technique) and A-Airbrush method with the MG suspension. To evaluate glaze/FCZ adhesion a 40N load was applied using esclerometer.

Result: The FCZ showed approximately 6.06g/cm^3 apparent density, 99.34% of relative density, and approximately 0.19% of porosity. The K_{IC} was 5.54MPa m$^{1/2}$, and the Vickers's hardness was 12.4GPa. SEM images revealed a homogeneous submicron grain size distribution (0.75±0.2 µm). XRD showed mainly the tetragonal phase. The glaze suspension behaved like a Newtonian fluid and presented a mean particle size of 166.8nm. Type-A glaze revealed a more uniform topography and higher bond strength to the zirconia substrate when compared to type-B glaze (conventional brush application).

Conclusion: The full-contour zirconia tested presented a homogeneous microstructure with high density and comparable mechanical properties to those available in the market. To guarantee the clinical applicability of the developed glaze application technique, adhesion studies between FCZ ceramic and resin-based cements are ongoing.

Student Presenter

Keywords: Ceramics and Dental materials

See more of: Fracture Resistance and Physico-Chemical Properties of Ceramics
See more of: Dental Materials 3: Ceramic-based Materials and Cements

<< Previous Abstract | Next Abstract >>