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Microstructural evaluation of Y-TZP/TiO2 composite

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Y-TZP ceramics, known as yttria stabilized tetragonal zirconia polycrystals are employed as dental implants due to its excellent mechanical properties, good esthetic and high biocompatibility. However, Y-TZP is bioinert and consequently has low interaction with bone tissue. One alternative to improve its bioactivity is the addition of a bioactive ceramic to the Y-TZP matrix. Titania (TiO2) is known to have good biocompatibility and was chosen to be added to the 3Y-TZP in order to improve such property. Synthesis was performed through coprecipitation of metal salts in a ammonium hydroxide solution, followed by washing, drying, milling and calcination. Ceramic powders were prepared to have up to 20 mol% of TiO2 over Y-TZP matrix. The powders were uniaxially pressed and sintered at dilatometer and in a tubular furnace from 1200 to 1500?C Ceramic pellets were characterized by X-ray diffraction with Rietveld refinement and scanning electron microscopy with field emission gun. Dilatometric analysis showed that samples containing TiO2, presented its higher densities for temperatures about 1300 C and a volume expansion at higher temperatures, with lower densities. Tetragonality, expressed as the relation between c/a lattice parameters measured after Rietveld refinements, in general, increases with increasing TiO2 content for all temperatures. Variations of crystal structure, density and cell volume could be related with TiO2 amount and sintering temperature. The overall results indicates that the crystalline structure of the Y-TZP/TiO2 composite was altered by the addition of titania.