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Y-TZP dental ceramics: Sintering process improvement using microwave energy.

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Conventional sintering techniques of yttria-tetragonal zirconia polycrystals (Y-TZP) ceramics have presented limitations regarding the sintering time and temperature, increasing the cost of the final dental and biomedical products. Herein, microwave sintering comes to be an interesting alternative by providing fast heating, high densification and grain size control, decreasing the total time to produce the ceramic. The aim of this study was to compare the effect of microwave sintering of a pre-sintered commercial dental Y-TZP ceramic and a Y-TZP produced from powders synthesized in a laboratory scale by the copreciptation route. Densification, fracture toughness, grain size and crystalline phase quantification of sintered samples were evaluated. The synthetized and commercial (Vita Zahnfabrik, Germany) groups were submitted to 1450 °C and 1350 °C sintering temperature for 15, 30 and 60 minutes. Both groups sintered at 1450°C for 15 minutes and 30 minutes showed the higher densification results (98% concerning to theoretical density). All the samples sintered at 1350 °C achieved 96TD% independent of the sintering time. XRD quantitative phase analysis indicates that samples are formed by 89% tetragonal and 11% cubic phases (0,833 standard deviation), except for the group prepared from coprecipitated powders sintered at 1450oC for 30 minutes, that presented 79% and 21% of tetragonal and cubic phases, respectively. Therefore, microwave sintering allows the preparation of dense ceramics with high tetragonal phase content. The sintering time and temperature induced differences at the Y-TZP microstructure.