

## Abstract

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**Project Code :** MRG5180028

**Project Title :** Influence of Zirconia Addition on Microstructure and Mechanical Properties of Porcelain Ceramic-Nanocomposites

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**Abstract:**

The effects of ZrO<sub>2</sub>-reinforced on the mechanical properties and crystallization behavior of leucite (KAlSi<sub>2</sub>O<sub>6</sub>) in dental ceramic with the short time - one step sintering and/or tempering firing procedure were investigated. Dense dental ceramic/20 wt.% ZrO<sub>2</sub> composites were prepared by sintering pressurelessly at 1060-1140 °C for 25-40 min and/or tempering at 1040 °C for 0-90 min. Microscope investigation and X-ray diffraction revealed the important role played by the m-ZrO<sub>2</sub> phase and the formation of nanocomposite structures of dental ceramic reinforced with crystalline leucite phase. Leucite crystals were initiated and grown up from the surface of ZrO<sub>2</sub> particles and acted as the bridge between them. Mean flexural strength and toughness of the materials can reach values of 154.6-192.8 MPa and 2.03-2.50 MPa·m<sup>1/2</sup>, respectively, which are higher than the dental ceramic (83.4 MPa, 1.01 MPa·m<sup>1/2</sup>) alone, with the significant statistical difference ( $p < 0.001$ ). The optimum sintering and/or tempering condition could be better conciliated with the nanocomposite structures formation and can improve the strength of the composite at high temperatures and suitable dwell times.

**Keywords :** Zirconia; Dental ceramic; Sintering; Nanocomposites; Mechanical properties