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**Composite nanostructured HAp/YSZ dental inserts – processing,
mechanical properties and application in dental restorations**

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Bioceramic dental inserts reduce polymerization shrinkage and affect mechanical properties of the insert-containing dental restorations. The aim of this study was to investigate the sintering conditions of composite nano-powder based on hydroxyapatite (HAp) and yttrium-stabilized ZrO₂ (YSZ) in order to optimize microstructure, fracture toughness, hardness and shear bond strength (SBS) between processed composite inserts and restorative materials. Composite powder obtained by mixing 80 wt. % of stoichiometric HAp synthesized by modified precipitation method and 20 wt. % of YSZ synthesized by plasma method, after homogenization by ultrasound treatment were isostatically pressed into cylinder-shaped insert green bodies. After dilatometric analysis, HAp inserts were sintered in the temperature range of 1200°C-1325°C. Microstructural analysis of fractured surface showed the presence of two different fracture mechanisms due to YSZ addition, which affected fracture toughness and hardness increase. Sintering temperature and different application protocols significantly affected SBS between novel dentin substituents and commercial adhesive materials.