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Assessment of Compressive Ratio and Sintering Temperature Effects on Mechanical Properties of Collagen/Hydroxyapatite Composite Scaffolds for Bone Tissue Engineering

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Abstract: Porous HA scaffolds were synthesized from bioceramics using the polyurethane (PU) sponge template method at various sintering temperature and compressive ratio to study mechanical properties. The as-prepared HA scaffolds were fabricated with collagen (COL) or collagen/HA particles (COL/HA, 9:1 ratio) in coating condition. The porous microstructure and mechanical properties of fabricated biomaterials were analyzed by FE-SEM and Shimadzu Compact Tabletop Testing Machine EZTest, respectively. It was revealed from the study that incorporation of COL or COL/HA materials into pure HA scaffolds in coating condition enhanced the mechanical properties of fabricated biomaterials significantly. It was also noteworthy that sintering the pure HA at 1200 °C and 1100 °C but fabricating with COL and COL/HA materials, respectively, demonstrated the best performances. In contrary, among 95, 75 and 50% compressive ratios, 50% compressive ratio at 1000 °C, 1100 °C and 1200 °C sintering temperature significantly improved the mechanical properties of the fabricated composite scaffolds.

Keywords: Scaffolds; Mechanical properties; Tissue engineering; Compressive ratio.