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PROCEEDINGS

Peeling Induced Defects Investigation of Hydroxyapatite/Polymer Porous Structures Fabricated by Vat Photopolymerization

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ABSTRACT

Defects are pivotal in influencing the mechanical performance of the hydroxyapatite (HAp) porous structure. In vat photopolymerization (VP) fabrication, directly peeling HAp/polymer green structure from the platform is an efficient approach but often introduces defects, compromising the mechanical performance of sintered HAp scaffolds. The peeling process is a physical phenomenon where the photocured HAp/polymer green structure exhibits resistance against applied peeling forces, which is influenced by its modulus and toughness. In this study, the peeling behavior of cubic-pore HAp (CP-HAp) green structures with varying levels of modulus and toughness was investigated in detail. The characterization results show that the HDDA CP-HAp structure with relatively high levels of modulus and toughness could effectively resist the peeling forces and inhibit the occurrence of peeling defects. Stress concentration and inadequate toughness in the HEMA CP-HAp structure lead to the formation of peeling defects. The CTFA and PHEA CP-HAp structures with low modulus exhibit both peeling cracks and numerous pores. The cracks result from stress-induced stretching, while the pores are caused by the coiled and loose molecular chain structure occupying space. Understanding the mechanism of peeling defect initiation in HAp porous structure contributes to improving resistance to such defects and efficiently fabricating high-performance ceramic porous structures using vat polymerization.

KEYWORDS

Defects analysis; peeling process; hydroxyapatite scaffolds; vat photopolymerization

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