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Preparation and mechanical properties of polylactic acid composites containing hydroxyapatite fibers

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Abstract

Ceramic-polymer composite biomaterials were prepared by hot-pressing a mixture consisting of poly-L-lactic acid (PLA) and hydroxyapatite fibers (HAF) with dimensions of $40 \times 150 \times 1/4$ mm length and $2 \times 10 \times 1/4$ mm diameter, which were converted from \hat{I}^2 - $\text{Ca}(\text{PO}_3)_2$ fibers. After PLA dissolved with methylene chloride was mixed with the fibers, the mixture was dried completely and subsequently hot-pressed uniaxially under a pressure of $40 \hat{A}$ MPa at $180 \hat{A}^\circ\text{C}$, resulting in the fabrication of the PLA/HAF composite. The modulus of elasticity was improved effectively even by introducing a small amount of HAF; almost no degradation in the bending strength was observed and the modulus of elasticity showed high values of $5 \hat{A} \times 10 \hat{A}$ GPa when the fibers of $20 \hat{A} \times 60 \hat{A}$ wt% were introduced. With increasing HAF content, the maximum strain decreases and the specimen is apt to show a brittle fracture; this result implies that HAF in the composites

can share the applied load efficiently due to the formation of a bond between HAF and PLA.



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Keywords

Composite; Hydroxyapatite; Fiber; Poly(lactic acid); Modulus of elasticity

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