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Review

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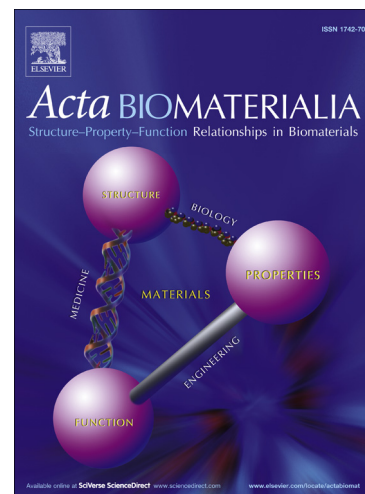
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Review: Calcium Phosphate Cements (CPCs) for bone substitution: chemistry, handling and mechanical properties

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Abstract: Since invented in the 1980s, Calcium Phosphate Cements (CPCs) have been increasingly used as bone substitutes. This article provides an overview on the chemistry, kinetics of setting, handling properties (setting time, cohesion and injectability) of CPCs for bone substitution, with a focus on their mechanical properties. Many processing parameters such as particle size, composition of cement reactants and additives, can be adjusted to control the setting process of CPCs, concomitantly influencing their handling and mechanical performance. Moreover, this review discloses the fact that although the mechanical strength of CPCs is generally low, it is not a real critical issue for their application for bone repair, an observation not often realized by many researchers and clinicians. CPCs with compressive strengths comparable to those of cortical bones can be produced through densification and/or homogenization of the cement matrix. The real limitation for CPCs appears to be their low fracture toughness and poor mechanical reliability (Weibull modulus), which so far have been rarely studied.

1. Introduction

Owing to diseases and traumatic events, a few million patients worldwide need to undertake bone grafting operations each year [1]. Bone grafting, firstly established two centuries ago, is the procedure to replace missing or damaged bones with materials from either patient themselves (autograft) or donors (allograft) [2, 3].

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