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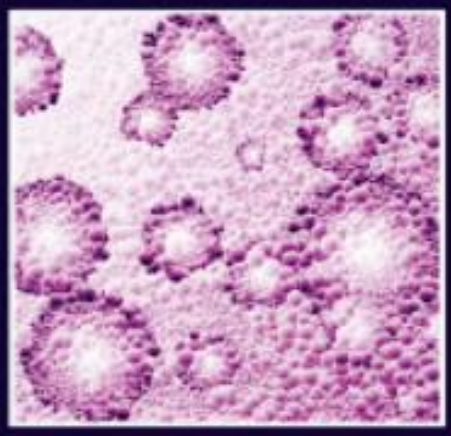

Fundamental Biomaterials: Ceramics

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Bioactive ceramic composite material stability, characterization, and bonding to bone

12

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Chapter Outline

AbstractMusculoskeletal conditions are the most commonly occurring medical conditions, and they have a considerable influence on the quality of health and living standard of the millions of people across the world. Annually, around the globe, approximately 2.3 million bone-tissue graft transplants are performed. The bone fracture, osteoporosis, osteoarthritis, and various neoplastic disorders are the common clinical problems related with bone and skeletal system. The common approaches to these bone problems are autografts or allografts. These protocols have certain limitations such as resorption, donor site morbidity, compromised supply, rejection rate up to 50% at some sites, and the risk of inducing transmissible diseases. Consequently, considerable attention has been directed toward the use of bioactive materials as synthetic grafts for bone regeneration. These include hydroxyapatite (HAP), tricalcium phosphate, bioactive glass, and glass ceramics. More significantly, calcium phosphates are the major constituent of bone mineral. The most extensively used synthetic calcium phosphate ceramic for bone replacement is HAP with a chemical formula of $Ca_{10}(PO_4)_6(OH)_2$. It has Ca:P molar ratio of 1.667 and is regarded as the most stable composition compared to other calcium phosphate ceramic within a pH range of 4.2–8.0. Calcium phosphate ce-

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