

Inorganically Surface Modified Polymers for Orthopaedic and Spinal Implants

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Technology description

Summary

PolyEther EtherKetone (PEEK) is increasingly being used in spinal implants and investigated as a biomaterial for orthopedic implants because of its mechanical toughness, resistance to thermal and chemical degradation, and non-toxicity. Its main advantages over titanium are its x-ray translucence and elastic modulus similar to that of bone. PEEK can be easily viewed with radiography and magnetic resonance to assess implant positioning and stability. It reduces stress shielding in bone and bone resorption, which are common problems from implanted metals with mismatched elasticity properties. PEEK is only now beginning to be explored as a material for joint replacements. It has been shown as an excellent material for articulation in the joint; however, it does not interface well with bone. There is a need for chemically or micro/nanostructurally modified PEEK surfaces that adhere strongly to the PEEK substrate and bond well with bone.

Description

University researchers have developed surface-nanopatterned polymers for implant applications, in particular, PEEK materials modified to exhibit nanostructured surfaces that promote osseointegration. Surface modification is done by coating the polymer with biocompatible metals, alloys, and oxides that are nanostructured by various means. Whereas polymers integrate poorly with bone, the invention's nanostructured coating enhances cell adhesion and promotes preferential stem cell differentiation to bone cells. The invention thus enables use of elastically bone-like and x-ray translucent PEEK for knee prostheses and other joint replacements or bone-anchored implants, e.g., hip and shoulder replacements and dental implants.

Institution

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