

permit the ceramic particles to sinter together thereby providing an open cell, porous ceramic matrix possessing the physical morphology of the original polyurethane foam material. Subsequently, the furnace was cooled at a rate of about 36° C./min until a final temperature of 25° C. was achieved. The final dimensions of the porous ceramic matrix were about 20 mm in diameter and about 20 mm in length and the density was approximately 2.9 g/cm³.

A PEEK injection molding machine was configured with an injection cavity sized to accommodate the porous ceramic matrix. The gating of the mold cavity was selected to ensure homogeneous and uniform filling of the cavity with the porous ceramic matrix in place. The mold temperature was set at approximately 120-200° C. and the barrel temperature was set at approximately 350-380° C. PEEK pellets were then loaded into the hopper of the injection molding machine from where it is fed on demand by an auger through a heater and into the mold cavity via a sprue. The PEEK material used was Victrex® PEEK 150G, a high performance unreinforced semi crystalline thermoplastic commercially available from Victrex USA, Inc., 300 Conshohocken State Road, Suite 120, West Conshohocken, Pa. 19428.

The porous ceramic matrix was loaded into the mold cavity when the injection molding machine was configured with the mold in the open position. The porous ceramic matrix was either directly loaded into the mold cavity or the scaffold was pre-heated to a temperature of about 230° C. prior to placement in the mold, as pre-heat reduces PEEK cool down upon contact with the porous ceramic matrix. The porous ceramic matrix geometry is such that the exterior profile substantially fills the mold cavity. The mold of the injection molding machine is then closed, thereby fully containing the porous ceramic matrix within the mold cavity.

In order to impregnate the open spaces of the porous ceramic matrix with the PEEK material, the PEEK is flowed into the mold cavity at an injection pressure of 1100 psi over a fill time of about seven minutes. Infiltration of the PEEK throughout the porous ceramic matrix during injection is assisted by maintaining a high mold temperature to reduce the viscosity of the PEEK during injection (attained utilizing a hot oil Thermolator from Budzar Industries, 38241 Willoughby Parkway, Willoughby, Ohio, 44094); using a central sprue which directs the PEEK down the center of the porous ceramic matrix; if the porous ceramic matrix has a hollow core, using a flow director within the hollow core to direct the flow of PEEK in a radial pattern to homogeneously fill the porous ceramic matrix; and preheating the porous ceramic matrix prior to insertion into the cavity to avoid localized cooling of the PEEK as it encounters the relatively cool porous ceramic matrix, thus maintaining reduced viscosity of the PEEK during injection.

The injection molding tool automatically ejects the porous ceramic matrix/PEEK composite blank from the cavity upon opening by the use of standard injection molding ejector pins. The composite blank is ejected to a collection chamber located underneath the tool for retrieval by the operator and can subsequently be machined to shape using implant machining practices which avoid chemical contamination by coolants, among other possibilities.

Any theory, mechanism of operation, proof, or finding stated herein is meant to further enhance understanding of the present application and is not intended to make the present application in any way dependent upon such theory, mechanism of operation, proof, or finding. It should be understood that while the use of the word preferable, preferably or preferred in the description above indicates that the feature so described may be more desirable, it nonetheless may not be

necessary and embodiments lacking the same may be contemplated as falling within the scope of the invention, that scope being defined by the claims that follow. In reading the claims, it is intended that when words such as "a," "an," "at least one," "at least a portion" are used, there is no intention to limit the claim to only one item unless specifically stated to the contrary. Further, when the language "at least a portion" and/or "a portion" is used, the item may include a portion and/or the entire item unless specifically stated to the contrary.

While the application has been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character, it being understood that only the selected embodiments have been shown and described and that all changes, modifications and equivalents that come within the spirit of the invention as defined herein or by any of the following claims are desired to be protected.

What is claimed is:

1. An implantable medical device, comprising:
 - a body including an external surface defining an outer profile of said device, said body further including:
 - a porous matrix having a compressive strength of about 10 MPa and including a series of interconnected macropores defined by a plurality of interconnected struts, said struts each including a hollow interior;
 - a filler material substantially filling at least a portion of said series of interconnected macropores, said filler material comprising a polymeric material selected from the group consisting of polyetheretherketone (PEEK), carbon-reinforced PEEK, and polyetherketoneketone (PEKK); and
 - a plurality of openings extending through at least a portion of said external surface and communicating with said hollow interior of at least a portion of said plurality of interconnected struts.
2. The device of claim 1, wherein said porous matrix is formed of at least one of an osteoconductive material and an osteoinductive material configured to be capable of undergoing a bone remodeling process.
3. The device of claim 1, wherein said porous matrix comprises a calcium based ceramic material.
4. The device of claim 1, wherein said porous matrix comprises Skelite®.
5. The device of claim 1, wherein said plurality of interconnected struts each have a hollow interior upon implantation of said device.
6. The device of claim 1, wherein said hollow interiors of said plurality of interconnected struts are interconnected and in communication with one another.
7. The device of claim 6, wherein said hollow interiors are isolated from said series of interconnected macropores before said filler material fills said series of interconnected macropores.
8. The device of claim 1, wherein said body includes a tool engagement portion substantially free of said porous matrix, said tool engagement portion being at least partially surrounded by said porous matrix and filler material and including a threaded aperture formed therein.
9. An implantable medical device, comprising:
 - a body including an external surface defining an outer profile of said device, said body further including:
 - a porous matrix including a series of interconnected macropores defined by a plurality of interconnected struts, said struts each including a hollow interior, the porous matrix having a compressive strength of about 10 MPa and comprising a calcium based ceramic material