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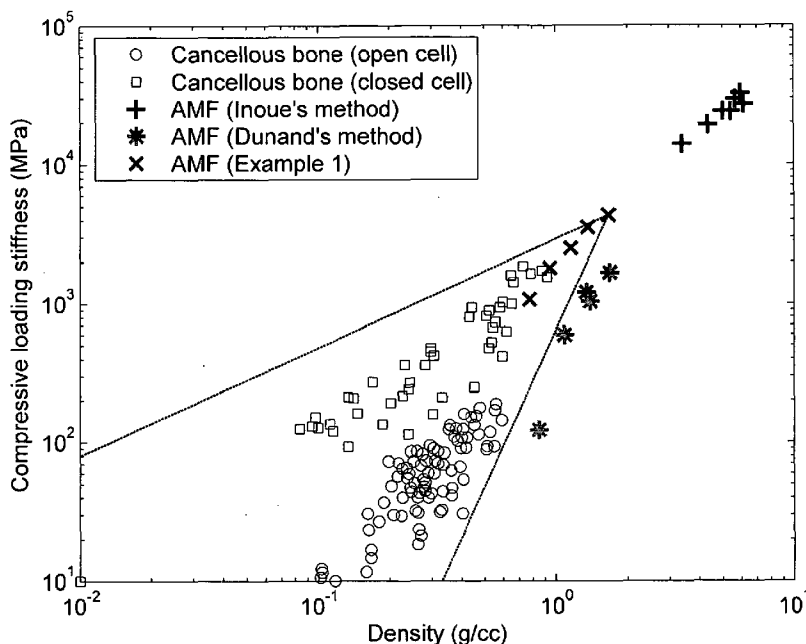
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(54) Title: AMORPHOUS METAL FOAM AS A PROPERTY-MATCHED BONE SCAFFOLD SUBSTITUTE



(57) Abstract: Amorphous metal foams and methods of making the same are provided. The amorphous metal foams have properties matching those of natural bone, enabling their use as bone replacement scaffolds. In one embodiment, for example, an amorphous metal foam has a density-dependent stiffness (or Young's modulus, denoted E) ranging from about $640p^{3.75}$ to about $2900p^{0.78}$, and a density dependent strength (σ_y) greater than about $8.1p^{2.57}$, wherein p (the density) is less than about 1.7 g/cc. These properties are illustrated graphically in Figures 10 and 11.

WO 2008/021358 A3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US07/17983

A. CLASSIFICATION OF SUBJECT MATTER
 IPC: **A61F 2/28(2006.01);C22C 45/00(2006.01)**

USPC: 148/403,561;164/66.1,485;623/23.55
 According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 U.S. : 148/403, 561; 164/66.1, 485; 623/23.55

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 WEST: search terms = amorphous and (metal or alloy) and (foam or porous), (palladium or pd or noble). See attached

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/0035502 A1 (KANG et al.) 26 February 2004 (26.02.2004), see entire document.	1-4, 7, 8, 11-15, 18-20
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Y		5, 6, 9, 10, 16, 17
Y	US 2005/0084407 A1 (MYRICK) 21 April 2005 (21.05.2005), see paragraph [0065] including Table	5, 6, 9, 10, 16, 17
A	US 5,306,309 A (WAGNER et al.) 26 April 1994 (26.04.1994), see entire document.	1-20
A	US 4,915,980 A (MATSUNAWA et al.) 10 April 1990 (10.04.1990), see entire document.	1-20

Further documents are listed in the continuation of Box C. See patent family annex.

Special categories of cited documents:		
"A" document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"B" earlier application or patent published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed	"&"	document member of the same patent family

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US07/17983

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation Sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
 2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of any additional fees.
 3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

 4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
- Remark on Protest**
- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
 - The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
 - No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US07/17983

BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-12, drawn to an amorphous metal foam.

Group II, claims 13-20, drawn to a method involving processing of a metal alloy under certain conditions of temperature and pressure.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: Group I requires Special Technical Features regarding density-dependent stiffness and density-dependent strength. These Special Technical Features bear no apparent relationship to anything in the method steps recited in independent claim 13 of Group II. Alternatively, none of the Special Technical Features recited in claim 13 appear related to materials having a certain density-dependent stiffness and density-dependent strength as required by Group I.