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- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,

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Published:

- with international search report (Art. 21(3))
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10 January 2013



WO 2012/158527 A3

(54) **Title:** ORGANOPHOSPHOROUS & MULTIVALENT METAL COMPOUND COMPOSITIONS & METHODS

(57) **Abstract:** Compositions and methods of their use to adhere a variety of materials together are disclosed herein. The compositions include at least multivalent metal compound, an effective amount of a compound that is structurally similar to phosphoserine, and can be mixed with an aqueous solution. The compositions provide adhesive and cohesive strength in both wet and dry environments which exhibit bond strength upon curing with the possible usage as bone cement for bone filler applications.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 12/37542

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - C04B 12/02 (2012.01)
USPC - 623/23.61
 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)
 USPC - 623/23.61;

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
 USPC - 623/23.61 ; 106/655; 106/691 ; 156/60; 156/94; 424/93.7

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 *** Databases: WEST (PGPB, USPT, USOC, EPAB, JPAB); Google, Google Scholar *** Search Terms Used: adhesive, multivalent metal, calcium phosphate, organophosphane, organophosphate, phosphoserine, bone, pyridoxyl, nicotinic, salicylic, tyrosine, phosphoserine, tyrosine phosphate, threonine phosphate, dihydroxyphenylalanine, DOPA, diphosphate, monop

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 2010/0121459 A1 (Garigapati et al.) 13 May 2010 (13.05.2010), especially para [0009]-[0012], [0020]-[0021], [0025]-[0034], [0048], [0050], [0052],	1-29, 59-74, 91-97, 105-106 and 109-116
Y	US 2003/0027872 A1 (Chaiko et al.) 06 February 2003 (06.02.2003), especially para [0019], [0036], [0040],	30-58, 75-90, 98-104, 107-108 and 117-124
Y	US 2003/0027872 A1 (Chaiko et al.) 06 February 2003 (06.02.2003), especially para [0019], [0036], [0040],	30-58, 75-90, 98-104, 107-108 and 117-124

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 22 October 2012 (22.10.2012)	Date of mailing of the international search report 0 2 NOV 2012
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Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774
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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 extra 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 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

Information on patent family members

International application No.

PCTYUS 12/37542

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: claims 1-29, 59-74, 91-97, 105-106 and 109-116

Group II: claims 30-58, 75-90, 98-104, 107-108 and 117-124

Group I: Claims 1-29, 59-74, 91-97, 105-106 and 109-116 are directed to adhesive compositions comprising multivalent metal compounds and organophosphanes, specifically a phosphoserine-based organophosphane having secondary-nitrogen phosphosenne groups with a bridging ketoalkyl or carboxyalkyl chain.

Group II: Claims 30-58, 75-90, 98-104, 107-108 and 117-124 are directed to adhesive compositions comprising multivalent metal compounds and organophosphanes, specifically a phosphoserine-based organophosphane have disubstituted, tertiary-nitrogen phosphosenne groups with a bridging ethylene chain.

The inventions listed as Groups I-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:

The groups share the technical features of an adhesive compositions comprising multivalent metal compounds and organophosphanes, specifically an phosphoserine-based organophosphane. However, these shared technical features fail to make a contribution over the prior art of US 2010/0121459 A1 to Garigapati et al., published 13 May 2010; which teaches an adhesive compositions comprising multivalent metal compounds and organophosphanes (para [0005] and [0009]), specifically a phosphoserine-based organophosphane (para [0028]).

Accordingly, unity of invention is lacking under PCT Rule 13.1.