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(54) Title: SYNERGISTIC COMBINATIONS OF CHROMATE-FREE CORROSION INHIBITORS

(57) Abstract: An anti-corrosive composition, comprising a combination of at least two of the following materials: vanadates, molybdates, tungstates, silicates, phosphates, borates, Ce cations, Y cations, La cations, Eu cations, Gd cations, Nd cations, and reaction products thereof.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US06/07305

A. CLASSIFICATION OF SUBJECT MATTER

IPC: **B32B 15/04** (2006.01); **C23F 11/00** (2006.01); **17/00** (2006.01)

USPC: 106/14.05; 252/387,389.2,389.3,389.4,389.62; 427/419.1; 428/469,472

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. : 106/14.05; 252/387,389.2,389.3,389.4,389.62; 427/419.1; 428/469,472

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)

Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,537,678 A1 (PUTNAM et al.) 25 March 2003, Table II, Table II and claims.	1-3, 9
X	US 5,322,560 A (DePue et al.) 21 June 1994, Example 2, claims.	1-2, 9
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Y		3-5
X	US 2004/0104377 A1 (Phelps et al.) 03 June 2004, Table 4 and the claims.	1-3, 9
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Y		4-5
X	US 2004/0262580 A1 (YU et al.) 30 December 2004, Table 1 and the claims.	1-3, 9
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Y		4-5

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

* 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 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 07 March 2008 (07.03.2008)	Date of mailing of the international search report 21 MAR 2008
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 Anthony J. Green Telephone No. 571-272-1700 DEBORAH A. THOMAS PARALEGAL SPECIALIST <i>DAT</i>

INTERNATIONAL SEARCH REPORTInternational application No.
PCT/US06/07305**C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,758,887 B2 (BHATIA et al.) 06 July 2004, Table 1 and the claims.	1-3, 9
X	US 5,059,640 A (HEGEDUS et al.) 22 October 1991, examples and claims.	1-2, 9
X	US 5,954,893 A (BALDWIN et al.) 21 September 1999, claims.	7
X	WO 2004/085551 A1 (DEACON et al.) 07 October 2004, claims.	1-2, 9

INTERNATIONAL SEARCH REPORT

International application No.
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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 1-5 and 7-9, drawn to an anti-corrosive composition, method of coating a substrate using an anti-corrosive composition and a substrate coated with an anti-corrosive composition that comprises a combination of at least two of the following materials: vanadates, molybdates, tungstates, silicates, phosphates, borates, Ce cations, Y cations, La cations, Eu cations, Gd cations, Nd cations, and reaction products thereof, provided that combinations that consist of two or more of the following materials are excluded: vanadates, borates, Ce cations, Y cations, La cations. .

Group II, claim 6, drawn to a method of high-throughput screening of potential corrosion inhibitors

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 II is drawn to a a method of sampling corrosion inhibitors that do not require the particulars of Group I namely an anti-corrosive composition, comprising:

a combination of at least two of the following materials: vanadates, molybdates, tungstates, silicates, phosphates, borates, Ce cations, Y cations, La cations, Eu cations, Gd cations, Nd cations, and reaction products thereof, provided that combinations that consist of two or more of the following materials are excluded: vanadates, borates, Ce cations, Y cations, La cations.

Continuation of B. FIELDS SEARCHED Item 3:

WEST

~~search terms: anti-corrosion, corrosion, anticorrosion, corrosivity~~

Form PCT/ISA/210 (extra sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

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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 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.: 1-5 and 7-9

- 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.