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(54) Title: METHODS AND SYSTEMS FOR 3D PRINTING OF REACTIVE VATERITE CEMENT

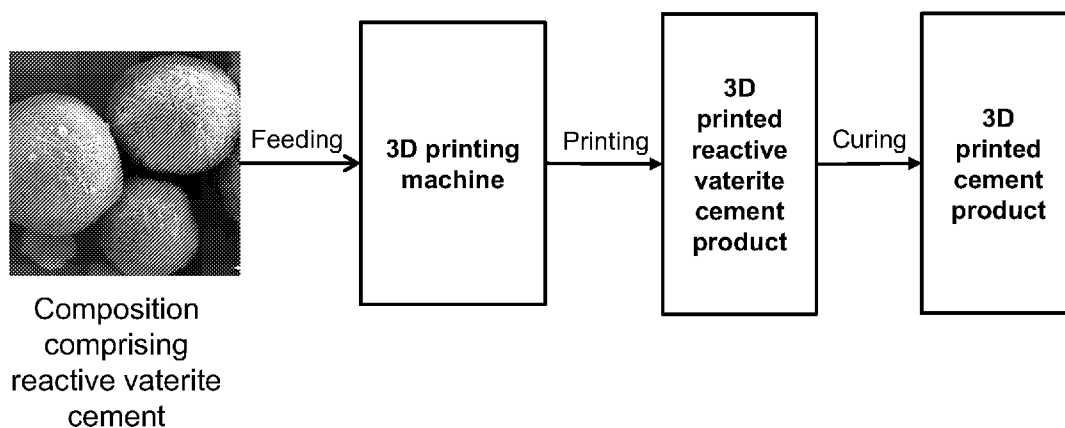


Figure 1

(57) Abstract: Provided herein are compositions, methods, and systems related to 3D printing a reactive vaterite cement composition, comprising feeding a composition comprising reactive vaterite cement through a 3D printing machine; printing a 3D printed reactive vaterite cement product; and curing the 3D printed reactive vaterite cement product by transforming reactive vaterite cement in the 3D printed reactive vaterite cement product to aragonite and/or calcite during and/or after the curing.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER		
IPC(8) - INV. - B29C 35/02; B29C 64/165; B29C 64/194; B22F 12/50; B33Y 70/10 (2023.01) ADD.		
CPC - INV. - B29C 35/0288; B22F 12/50; B29C 64/194; B29C 64/165; B33Y 70/10; C01F 11/18 (2023.01) ADD. - C08K 2003/265; C08K 2003/267 (2023.01)		
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) See Search History document		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched See Search History document		
Electronic database consulted during the international search (name of database and, where practicable, search terms used) See Search History document		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2021/0261429 A1 (ARELAC INC.) 26 August 2021 (26.08.2021) entire document	1-3, 20, 21
Y	WO 2017/196328 A1 (HEWLETT-PACKARD DEVELOPMENT COMPANY L.P.) 16 November 2017 (16.11.2017) entire document	1-3
Y	CN 214605934 U (JIANGSU XUZHOU TECHNICIAN INSTITUTE) 05 November 2021 (05.11.2021) machine translation	20, 21
A	US 2018/0022614 A1 (IMERYS USA INC.) 25 January 2018 (25.01.2018) entire document	1-3, 20-22
☐ 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 "D" document cited by the applicant in the international application "E" earlier application or patent but published on or after the international filing date "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) "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 "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 "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 "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 "&" document member of the same patent family		
Date of the actual completion of the international search 09 January 2023		Date of mailing of the international search report FEB 14 2023
Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300		Authorized officer Taina Matos Telephone No. PCT Helpdesk: 571-272-4300

INTERNATIONAL SEARCH REPORT

International application No.

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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.: 4-19, 23-27
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:

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.