

(51) International Patent Classification:  
D21C 5/02 (2006.01) D21H 21/10 (2006.01)  
D21H 11/14 (2006.01) D21H 21/20 (2006.01)  
D21H 17/28 (2006.01)

(21) International Application Number:  
PCT/US2024/035812

(22) International Filing Date:  
27 June 2024 (27.06.2024)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
63/510,759 28 June 2023 (28.06.2023) US  
20236130 12 October 2023 (12.10.2023) FI

(71) Applicant: **KEMIRA OYJ** [FI/FI]; Energiakatu 4, FI-00180 Helsinki (FI).

(71) Applicant (for LC only): **KEMIRA WATER SOLUTIONS, INC.** [US/US]; 200 Galleria Parkway, Suite 1500, Atlanta, Georgia 30339 (US).

(72) Inventors: **RISER, Jennifer**; 200 Galleria Parkway, Suite 1500, Atlanta, Georgia 30339 (US). **CHEN, Junhua**; 200 Galleria Parkway, Suite 1500, Atlanta, Georgia 30339 (US). **LUO, Yuping**; 200 Galleria Parkway, Suite 1500, Atlanta, Georgia 30339 (US).

(74) Agent: **TESKIN, Robin, L.**; Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C., Intellectual Property Department, 901 K Street, NW, Suite 900, Washington, District of Columbia 20001 (US).

(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, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(54) Title: USE OF AMPHOTERIC EMULSION POLYMERS WITH STRENGTH RESINS AS RETENTION AND DRAINAGE AIDS

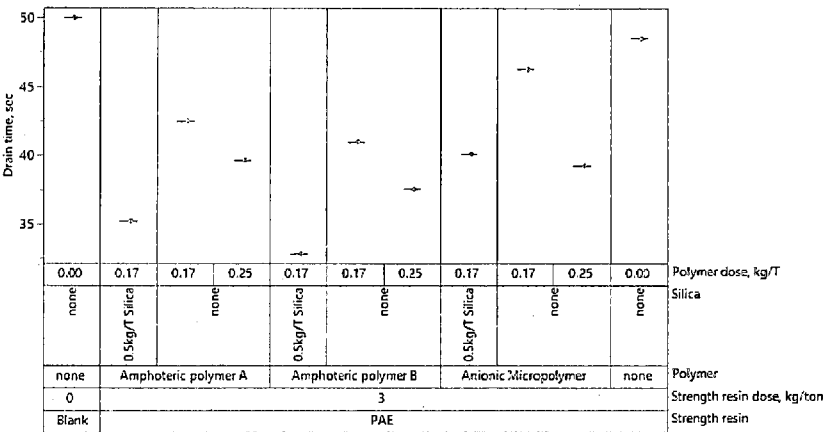


FIG 1

(57) Abstract: The present invention generally relates to methods and compositions for manufacture of tissue, paper, or board and for enhancing retention and drainage thereof. In particular, the disclosure provides methods for enhancing retention and drainage by addition of a retention and drainage aid comprising reactive cationic polymers (e.g., cationic strength resins), water-soluble amphoteric terpolymers, and optionally anionic organic or inorganic microparticles. Preparation of paper sheets under these conditions provides improved retention, drainage time, STFI and burst strength, and improved hydrophobic particle control.

(84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

**Published:**

- *with international search report (Art. 21(3))*

(88) **Date of publication of the international search report:**

24 April 2025 (24.04.2025)

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 24/35812

## A. CLASSIFICATION OF SUBJECT MATTER

IPC - INV. D21C 5/02, D21H 11/14, D21H 17/28, D21H 21/10 (2024.01)  
ADD. D21H 21/20 (2024.01)

CPC - INV. D21C 5/02, D21H 11/14, D21H 17/28, D21H 21/10

ADD. D21H 21/20

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 data base consulted during the international search (name of data base 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. |
|---------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X<br>---<br>Y | US 2015/0041092 A1 (Kemira Oyj) 12 February 2015 (12.02.2015); entire document, abstract, [0030], [0031], [0062], [0092], [0112] | 1-3<br>---<br>13      |
| Y             | US 2016/0201267 A1 (KEMIRA OYJ) 14 July 2016 (14.07.2016); entire document, abstract, [0006]                                     | 13                    |
| A             | US20190315890 A1 (BASF SE) 17 October 2019 (17.10.2019); entire document                                                         | 1-3, 13               |
| A             | US 2019/0024306 A1 (Kemira Oyj) 24 January 2019 (24.01.2019); entire document                                                    | 1-3, 13               |

☐ 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

20 August 2024

Date of mailing of the international search report

**OCT 10 2024**

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. 571-273-8300

Authorized officer

Kari Rodriguez

Telephone No. PCT Helpdesk: 571-272-4300

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 24/35812

**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.: 4-12, 14-15  
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.