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A61K 9/16 (2006.01)	*C07C 45/63* (2006.01)
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C07C 227/18 (2006.01)	*C07C 63/10* (2006.01)
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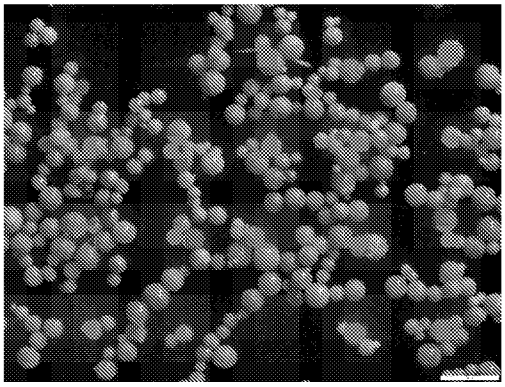
(54) Title: BIODEGRADABLE POLYMER

FIGURE 2



(57) Abstract: A polymer having a backbone comprising a polyhydroxylated polymer cross linked by a C3 to C8 diacid.

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[Continued on next page]

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, 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).

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— *with international search report (Art. 21(3))*
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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2019/055392

A. CLASSIFICATION OF SUBJECT MATTER

INV.	C08J3/24	C08L101/06	C08K5/092	C08F8/14	C08F16/06
	C08J3/12	C08J3/075	C08L101/16	A61K49/04	A61K9/16
ADD.	C08K5/3445	C08L29/04	C07C227/18	C07C229/62	C08F8/30

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)
C08F C08K C08L

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)
EPO-Internal, WPI Data, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 699 920 B1 (ANDROS NICHOLAS [US]) 2 March 2004 (2004-03-02) claims 1,2; example 5; table 1 column 1, lines 38-40	1,2,4,7, 8,10,11, 14-17,36

X	DE 480 866 C (CONSORTIUM ELEKTROCHEM IND) 15 August 1929 (1929-08-15) claim; example 6	1,2,4,7, 8,10,11, 14-17,36

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[X] Further documents are listed in the continuation of Box C.

[X] 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

"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	Date of mailing of the international search report
7 February 2020	29/06/2020

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Hollender, C

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2019/055392

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:

see additional 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 an 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.:

4, 5, 13(completely); 1, 2, 7, 8, 10, 11, 14-17, 36(partially)

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/IB2019/055392

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	MAZUMDAR NASREEN ET AL: "Iodine complexes of acid-functionalized poly(vinyl alcohol) hydrogels: synthesis, characterization and release studies", JOURNAL OF POLYMER MATERIALS, NEW, DELHI, INDIA, vol. 33, no. 1, 2016, pages 41-52, XP009517934, ISSN: 0973-8622 abstract; figures 1,3 page 42, right-hand column - page 46, left-hand column -----	1,2,4,7, 8,10,11, 14-17,36
X,P	JP 2018 145328 A (KURARAY CO) 20 September 2018 (2018-09-20) claims 1, 4; examples 5, 6, 9; table 1 paragraphs [0010] - [0011], [0018] - [0020] paragraphs [0029] - [0030], [0042] -----	1,2,4,5, 7,8,10, 11, 13-17,36

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 4, 5, 13(completely); 1, 2, 7, 8, 10, 11, 14-17, 36(partially)

A polymer having a backbone comprising a polyhydroxylated polymer cross-linked by a saturated C3 to C8 dicarboxylic acid.
A method of making a biodegradable polymer comprising cross-linking polyhydroxylated polymer with a compound of formula 2, wherein X is -OH and wherein Q is a group of the formula 1a wherein n is 1 to 5, or Q is a C1 to C6 alkylene, wherein alkylene groups are optionally substituted by -OH or -NH2, to form ester linkages between the polyhydroxylated polymer and the compound of the formula 2 thereby cross-linking the polymer.

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2. claims: 3, 6(completely); 1, 2, 7, 8, 10-12, 14-17, 36(partially)

A polymer having a backbone comprising a polyhydroxylated polymer cross-linked by a mono-unsaturated C3 to C8 dicarboxylic acid or a C6 to C8 di-unsaturated dicarboxylic acid.
A method of making a biodegradable polymer comprising cross-linking polyhydroxylated polymer with a compound of formula 2, wherein X is -OH and wherein Q is a C2 to C6 alkenylene group, to form ester linkages between the polyhydroxylated polymer and the compound of the formula 2 thereby cross-linking the polymer.

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3. claims: 9, 37(completely); 8, 10-12, 14-17, 36(partially)

A polymer formed by cross-linking a polymer comprising a polyhydroxylated polymer with a compound of the formula 2 wherein ester links are formed between the polyhydroxylated polymer and the compound of the formula 2; wherein X is a suitable leaving group (with -OH being excluded); and Q is a group of the formula 1a, wherein n is 1 to 5, or Q is a C1 to C6 alkylene or C2 to C6 alkenylene group, wherein alkylene groups are optionally substituted by -OH or -NH2.
A method of making a biodegradable polymer comprising cross-linking polyhydroxylated polymer with a compound of formula 2, wherein X is a suitable leaving group (with -OH being excluded) and wherein Q is a group of the formula 1a, wherein n is 1 to 5, or Q is a C1 to C6 alkylene or C2 to C6 alkenylene group, wherein alkylene groups are optionally substituted by -OH or -NH2, to form ester linkages between the polyhydroxylated polymer and the compound of the formula 2 thereby cross-linking the polymer.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

4. claims: 18-24

A cross-linked polymer according to any of claims 1 to 17, wherein the cross-linked polymer further comprises an imageable agent.

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5. claims: 25-31

A cross-linked polymer according to any of claims 1-24, wherein the cross-linked polymer is ionically charged at pH 7.4.
A cross-linked polymer according to any of claims 1-25, wherein the cross-linked polymer comprises a covalently bound ionic group which is ionized at pH 7.4.
A cross-linked polymer according to claims 25-30, wherein the cross-linked polymer is electrostatically associated with a drug carrying an opposite charge.

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6. claims: 32-35, 38

A cross-linked polymer according to any of the claims 1-31 in the form of a microparticle or microsphere.
A microparticle or microsphere comprising a cross-linked polymer according to any of claims 1 to 31.
A microparticle or microsphere according to either of claims 32 or 33 for use in the embolization of a blood vessel.
A pharmaceutical composition comprising one or more microparticles or microspheres according to either of claims 32 or 33 and a pharmaceutically acceptable carrier or diluent.
A method of making a biodegradable polymer microsphere comprising: providing a first liquid, which is a solvent having dissolved therein (i) a polymer comprising polyvinylalcohol (PVA) and (ii) a compound of the formula 2 wherein Q is a group of the formula 1a wherein n is 1 to 5 or Q is a C1 to C6 alkylene or C2 to C6 alkenylene group, wherein alkylene groups are optionally substituted by -OH or -NH2 ; and X is -OH or a suitable leaving group; providing a second liquid which is immiscible with the first liquid; bringing the first liquid into contact with the second liquid such that the first liquid forms a discontinuous phase within the second liquid; and cross-linking the PVA with the compound of the formula 2 within the discontinuous phase such as to form microspheres.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2019/055392

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6699920 B1	02-03-2004	NONE	
DE 480866 C	15-08-1929	NONE	
JP 2018145328 A	20-09-2018	NONE	