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(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, 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)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations*

Published:

— *with international search report*

(88) Date of publication of the international search report:
16 October 2003

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: PROCESS FOR DEPOSITING STRONG ADHEREND POLYMER COATING ONTO AN ELECTRICALLY CONDUCTIVE SURFACE

(57) Abstract: Process for depositing by electrografting a strong adherent polymer coating onto an electrically conductive surface comprising an electrochemical grafting at the surface of an active monomer for forming a primer coating P onto said surface and having as general formula: X0 (meth)acrylate wherein X is either part of a preformed polymer or is an intermediate agent for polyaddition reaction or is an anchoring group for attachment of a molecule having at least one complementary reactive group. Such process allows formation of new primer by one-step electro-grafting of a reactive polymer called macromonomer. Such process also allows further modification of an initial electrografted polymer (called primer coating) to increase the coating thickness by the so-called grafting-from technique i.e. polymerization of a second monomer or to introduce other types of polymers(also called top coating) via covalent attachment between the primer and the top coating through the X ester group by the so called grafting onto technique. Such process also allows to graft onto the primer coating compounds like functional polymer, peptide, protein, oligonucleotide, dyes, drugs, anti-bacterian compounds.

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 02/06433

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C08F8/00 C08F2/58 C08F292/00 C09D5/44

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)
IPC 7 C08F C09D

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 practical, 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.
A	DE 38 06 014 A (LICENTIA GMBH) 7 September 1989 (1989-09-07) page 2, line 48 -page 3, line 3 claims 1-3,13	1,26,28
A	CH 623 608 A (BATTELLE MEMORIAL INSTITUTE) 15 June 1981 (1981-06-15) examples claims 1,2,6	1,26,28
A	PATENT ABSTRACTS OF JAPAN , 20 September 1994 (1994-09-20) & JP 06 166954 A (OSAKA GAS CO. LTD.), 14 June 1994 (1994-06-14) abstract see also Derwent abstract AN 1994-230840	1,26

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

[X] Patent family members are listed in 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 document but published on or after the international filing date

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"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
23 May 2003	06. 06. 2003

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, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Bettels, B

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	CHEMICAL ABSTRACTS, vol. 102, no. 12, 1985 Columbus, Ohio, US; abstract no. 102 150938, SHAPOVAL, G. S.; PUD, A. A.; BAGRII, V. A.: "Modification of a steel surface by electrochemical polymerization " XP002221569 & Neftepererabotka i Neftekhimiya (Kiev) (1984), 27, 45-8 abstract	1,19,26, 28
X,P	LOU X ET AL: "Electrografting of Preformed Aliphatic Polyesters onto Metallic Surfaces" LANGMUIR, ACS, WASHINGTON, DC, US, vol. 18, 3 January 2002 (2002-01-03), pages 2785-2788, XP002223305 ISSN: 0743-7463 see entire paper	1,2,9, 14,15, 17,26,28
A	TAKEUCHI Y ET AL: "PREPARATION OF AMPHIPHILIC CARBON BLACK BY POSTGRAFTING OF POLYETHYLENEIMINE TO GRAFTED POLYMER CHAINS ON THE SURFACE" POLYMER BULLETIN, SPRINGER VERLAG. HEIDELBERG, DE, vol. 41, no. 1, 1 July 1998 (1998-07-01), pages 85-90, XP000771787 ISSN: 0170-0839 see entire paper	1,2,16, 21,22
A	WO 98 12530 A (SOANE BIOSCIENCES INC) 26 March 1998 (1998-03-26) claims 1,2,9,10	1,20,21, 26
A	GB 1 348 819 A (TOYOTA MOTOR CO LTD) 27 March 1974 (1974-03-27) page 1, line 44 - line 65 examples 6,10-13 claims 1,3,9	1,13,26
A	BAUTE N ET AL: "BONDING ELECTROPOLYMERIZATION: A NEW ELECTRON-TRANSFER STRATEGY FOR THE TAILORING OF PERFORMANT POLYMER-BASED COMPOSITES" MACROMOLECULAR SYMPOSIA, WILEY VCH, WEINHEIM, DE, vol. 134, October 1998 (1998-10), pages 157-166, XP000801475 ISSN: 1022-1360 see entire paper	1

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 02/06433

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	REINHARD G ET AL: "SCHICHTBILDENDE ELEKTROPOLYMERISATION VON ACRYLSAEURE UND KORROSIONSSCHUTZ" FARBE + LACK, CURT R.VINCENTZ VERLAG. HANNOVER, DE, vol. 96, no. 12, 1 December 1990 (1990-12-01), pages 942-946, XP000216568 ISSN: 0014-7699 see entire paper	1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP 02/06433

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 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 fee, this Authority did not invite payment of any additional fee.

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.

☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. Claims: 1 (in part), 16-19, 26-33 (in part)

   Process for the preparation of a polymer coating on an electrically conductive surface by electro grafting, comprising electrochemical grafting of a reactant containing a (meth)acryloyl structural element, characterised by (i) the (meth)acryloyl group being part of an oligomer.

2. Claims: 1 (in part), 2-15, 26-33

   Process for the preparation of a polymer coating on an electrically conductive surface by electro grafting, comprising electrochemical grafting of a reactant containing a (meth)acryloyl structural element, characterised by (ii) the (meth)acryloyl group being part of an intermediate product which can initiate (further) polyaddition reactions.

3. Claims: 1 (in part), 20-25, 26-33 (in part)

   Process for the preparation of a polymer coating on an electrically conductive surface by electro grafting, comprising electrochemical grafting of a reactant containing a (meth)acryloyl structural element, characterised by (iii) the (meth)acryloyl group being part of an anchoring group.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP 02/06433

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
DE 3806014	A	07-09-1989	DE	3806014 A1	07-09-1989
CH 623608	A	15-06-1981	CH	623608 A5	15-06-1981
JP 06166954	A	14-06-1994	NONE		
WO 9812530	A	26-03-1998	US	5935401 A	10-08-1999
			AU	4431597 A	14-04-1998
			EP	0927352 A2	07-07-1999
			JP	2001500971 T	23-01-2001
			US	2002053399 A1	09-05-2002
			WO	9812530 A2	26-03-1998
			US	6176962 B1	23-01-2001
			US	6056860 A	02-05-2000
GB 1348819	A	27-03-1974	JP	49023808 B	18-06-1974
			CA	945109 A1	09-04-1974
			DE	2162284 A1	06-07-1972
			US	3759797 A	18-09-1973