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(54) Title: WATER-SOLUBLE POLYMERIC SUBSTRATE HAVING METALLIC NANOPARTICLE COATING

(57) Abstract: A metallic nanoparticle coated water-soluble polymeric substrate and the process for preparing and using the same is described.



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## INTERNATIONAL SEARCH REPORT

International application No

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A. CLASSIFICATION OF SUBJECT MATTER  
 INV. C23C14/20 C23C14/00 G01N33/00

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)

C23C G01N

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, INSPEC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                               | Relevant to claim No.                   |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| X         | KUNZ M S ET AL: "orphologies of discontinuous gold films on amorphous polymer substrates"<br>JOURNAL OF APPLIED PHYSICS USA,<br>vol. 72, no. 9,<br>1 November 1992 (1992-11-01), pages<br>4458-4460, XP002417849 | 1,3,5,6,<br>9-11,<br>14-17,<br>20,30-32 |
| Y         | the whole document<br><br>-----<br>-/--                                                                                                                                                                          | 7,8,12,<br>13,18,<br>19,21-24           |

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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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. |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X         | YU LU ET AL: "High-Density Silver Nanoparticle Film with Temperature-Controllable Interparticle Spacing for a Tunable Surface Enhanced Raman Scattering Substrate"<br>NANO LETTERS, AMERICAN CHEMICAL SOCIETY, WASHINGTON, DC, US,<br>vol. 5, no. 1,<br>16 December 2004 (2004-12-16), pages 5-9,<br>XP002408386<br>ISSN: 1530-6984 | 1-6,9,<br>30-32       |
| Y         | page 6, right-hand column, line 15 - page 7, left-hand column, line 10                                                                                                                                                                                                                                                              | 12,13                 |
| X         | WO 03/106573 A (NANOPOWDERS IND LTD [IL]; GARBAR ARKADY [IL]; DE LA VEGA FERNANDO [IL]) 24 December 2003 (2003-12-24)                                                                                                                                                                                                               | 25-29                 |
| Y         | page 11, line 3 - line 12; example 2<br>page 4, line 26 - line 28                                                                                                                                                                                                                                                                   | 18                    |
| Y         | PATTABI M ET AL: "Electrical behaviour of discontinuous silver films deposited on softened polyvinylpyridine substrates"<br>JOURNAL OF PHYSICS D (APPLIED PHYSICS) IOP PUBLISHING UK,<br>vol. 31, no. 1, 1 July 1998 (1998-07-01),<br>pages 19-23, XP002417850<br>paragraphs [0001], [0002]                                         | 7,21,33               |
| Y         | US 2003/174384 A1 (HALAS NANCY J [US] ET AL) 18 September 2003 (2003-09-18)<br>paragraph [0022]                                                                                                                                                                                                                                     | 33                    |
| A         | US 5 928 517 A (SMITH BARBARA F [US] ET AL) 27 July 1999 (1999-07-27)<br>column 2, line 58 - column 3, line 26                                                                                                                                                                                                                      | 1-33                  |
| Y         | WO 02/087749 A (POSTECH FOUNDATION [KR]; LEE MU-SANG [KR]; NAM SANG-IL [KR]; MIN EUN-S) 7 November 2002 (2002-11-07)<br>page 3, line 4 - page 4, line 31                                                                                                                                                                            | 22-24                 |
| Y         | US 6 416 818 B1 (AIKENS JOHN H [US] ET AL) 9 July 2002 (2002-07-09)<br>column 3, line 21 - column 4, line 29                                                                                                                                                                                                                        | 8,19                  |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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| Patent document<br>cited in search report |    | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|----|---------------------|----------------------------|---------------------|
| WO 03106573                               | A  | 24-12-2003          | AU 2003241128 A1           | 31-12-2003          |
|                                           |    |                     | CN 1668712 A               | 14-09-2005          |
|                                           |    |                     | EP 1521811 A1              | 13-04-2005          |
|                                           |    |                     | JP 2005530005 T            | 06-10-2005          |
|                                           |    |                     | KR 20060012542 A           | 08-02-2006          |
| US 2003174384                             | A1 | 18-09-2003          | US 2005018274 A1           | 27-01-2005          |
| US 5928517                                | A  | 27-07-1999          | AU 6024996 A               | 18-12-1996          |
|                                           |    |                     | WO 9638227 A1              | 05-12-1996          |
| WO 02087749                               | A  | 07-11-2002          | CA 2445877 A1              | 07-11-2002          |
|                                           |    |                     | CN 1509206 A               | 30-06-2004          |
|                                           |    |                     | EP 1383597 A1              | 28-01-2004          |
|                                           |    |                     | JP 2004533540 T            | 04-11-2004          |
|                                           |    |                     | US 2004147618 A1           | 29-07-2004          |
| US 6416818                                | B1 | 09-07-2002          | AU 758075 B2               | 13-03-2003          |
|                                           |    |                     | AU 5567599 A               | 06-03-2000          |
|                                           |    |                     | CA 2340751 A1              | 24-02-2000          |
|                                           |    |                     | DE 69921161 D1             | 18-11-2004          |
|                                           |    |                     | DE 69921161 T2             | 27-10-2005          |
|                                           |    |                     | EP 1109741 A1              | 27-06-2001          |
|                                           |    |                     | JP 2003527454 T            | 16-09-2003          |
|                                           |    |                     | WO 0009446 A1              | 24-02-2000          |