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6 August 2009



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(54) Title: ZWITTERIONIC BLOCK COPOLYMERS AND METHODS

(57) Abstract: Zwitterionic block copolymers having oppositely charged or chargeable terminal groups, and methods of making and using the same, are disclosed. The zwitterionic block copolymers can undergo microphase separation.

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/US2008/071916

**A. CLASSIFICATION OF SUBJECT MATTER**  
INV. C08F293/00 H01L21/28 G03F7/00

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)  
C08F H01L G03F A61K

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, COMPENDEX, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>AYRES N ET AL: "Stimuli-responsive surfaces using polyampholyte polymer brushes prepared via atom transfer radical polymerization" LANGMUIR, vol. 23, no. 7, 27 March 2007 (2007-03-27), pages 3744-3749, XP002515704 AMERICAN CHEMICAL SOCIETY US page 3748; figure 2</p> <p align="center">----- -/--</p>	<p>1,2, 12-17</p>

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
- \*E\* earlier document 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

18 May 2009

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Name and mailing address of the ISA/

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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2008/071916

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>AYRES N ET AL: "Stimuli-responsive polyelectrolyte polymer brushes prepared via atom-transfer radical polymerization" LANGMUIR, vol. 23, no. 1, 2 January 2007 (2007-01-02), pages 182-189, XP002515705 AMERICAN CHEMICAL SOCIETY, US pages 183,188 - page 189; figure 3</p>	1,2, 12-17
X	<p>XIN X ET AL: "Synthesis of zwitterionic block copolymers via RAFT polymerization" EUROPEAN POLYMER JOURNAL, vol. 41, no. 7, 1 July 2005 (2005-07-01), pages 1539-1545, XP004871131 PERGAMON PRESS LTD. OXFORD, GB ISSN: 0014-3057 Scheme 1 page 1541; figure 4</p>	1,2, 12-17
X	<p>LOWE A B ET AL: "SYNTHESIS AND CHARACTERIZATION OF ZWITTERIONIC BLOCK COPOLYMERS" MACROMOLECULES, vol. 31, no. 18, 8 September 1998 (1998-09-08), pages 5991-5998, XP000776853 ACS, WASHINGTON, DC, US ISSN: 0024-9297 Scheme 1 page 5994; figure 2 page 5997, column 2; figure 4 abstract</p>	1,2, 12-17
A	<p>SANG-MIN PARK ET AL: "Directed Assembly of Lamellae-Forming Block Copolymers by Using Chemically and Topographically Patterned Substrates" ADVANCED MATERIALS, vol. 19, no. 4, 26 January 2007 (2007-01-26), pages 607-611, XP007905662 WILEY VCH, WEINHEIM, DE ISSN: 0935-9648 [retrieved on 2007-01-26] the whole document</p>	1-17
A	<p>US 2004/256662 A1 (BLACK CHARLES T [US] ET AL) 23 December 2004 (2004-12-23) cited in the application the whole document</p>	1-17

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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2008/071916

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KONG X ET AL: "Amphiphilic polymer brushes grown from the silicon surface by atom transfer radical polymerization" MACROMOLECULES, vol. 34, no. 6, 13 March 2001 (2001-03-13), pages 1837-1844, XP002528495 AMERICAN CHEMICAL SOCIETY, US the whole document -----	1-17

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2008/071916

## 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 allsearchable 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.:  
  
1-17
  
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.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

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

1. claims: 1-6, 12-17

A method of assembling a zwitterionic block copolymer having charged or chargeable groups at both ends, and the corresponding polymer.

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2. claims: 7-11

A method for patterning a substrate by depositing and annealing a zwitterionic block copolymer having charged or chargeable groups at both ends.

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3. claims: 18-20

A zwitterionic block copolymer having charged or chargeable groups at both ends and with a non-terminal zwitterionic group.

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4. claims: 21-25

A method to obtain a triblock zwitterionic block copolymer where the first and second block are not obliged to bear a charged or chargeable group, but the initiator must bear a charged or chargeable group.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2008/071916

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004256662	A1	23-12-2004	
		CN 1799131 A	05-07-2006
		EP 1647050 A1	19-04-2006
		WO 2004114389 A1	29-12-2004
		KR 20060017532 A	23-02-2006
		US 2006163646 A1	27-07-2006
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