Title: TUNING THE PROPERTIES OF CONJUGATED POLYEOLECTROLYTES AND APPLICATION IN A BIOSENSOR PLATFORM

Abstract: The present invention provides a method of detecting a biological agent including contacting a sample with a sensor including a polymer system capable of having an alterable measurable property from the group of luminescence, anisotropy, redox potential and uv/vis absorption, the polymer system including an ionic conjugated polymer and an electronically inert polyelectrolyte having a biological agent recognition element bound thereto, the electronically inert polyelectrolyte adapted for undergoing a conformational structural change upon exposure to a biological agent having affinity for binding to the recognition element bound to the electronically inert polyelectrolyte, and detecting the detectable change in the alterable measurable property. A chemical moiety being the reaction product of (i) a polyelectrolyte monomer and (ii) a biological agent recognition element-substituted polyelectrolyte monomer is also provided.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : C07K 1/13, 17/08; C12N 9/96; G01N 33/533, 33/545, 33/547
US CL. : 435/188; 436/531, 532, 533, 546; 530/391.5, 402

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)

U.S. : 435/188; 436/531, 532, 533, 546; 530/391.5, 402

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)

Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 5,866,322 B1 (JOU et al) 02 February 1999 (02.02.1999), structure of column 16, lines 35-40; col. 18, lines 50-60 wherein n is a repeating unit of 10-50.</td>
<td>1, 3</td>
</tr>
<tr>
<td>X, P</td>
<td>US 6,251,866 B1 (PRAKASH et al) 26 June 2001 (26.06.2001), structure of col. 8, lines 3-17, A-P-L wherein P is a PEG polymer, L is the member of a specific binding pair.</td>
<td>1, 3</td>
</tr>
<tr>
<td>X</td>
<td>US 5,166,320 B1 (WU et al) 24 November 1992 (24.11.1992), claims 1 and 3 wherein the polycation is polylysine.</td>
<td>1, 3</td>
</tr>
<tr>
<td>X, P</td>
<td>US 6,312,727 B1 (SCHACHT et al) 06 November 2001 (06.11.2001), the last structure of Fig. 8; &quot;cations polymers&quot; of column 7, lines 15-27.</td>
<td>1, 3</td>
</tr>
<tr>
<td>A</td>
<td>WO 00/66790 A1 (THE REGENTS OF THE UNIVERSITY OF CALIFORNIA) 09 November 2000 (09.11.2000), claims 1 and 20.</td>
<td>1-4 and 21</td>
</tr>
</tbody>
</table>

☐ 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 application or patent 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:
11 March 2003 (11.03.2003)

Date of mailing of the international search report: 14 MAY 2003

Authorized officer

Mary E. Ceperley

Telephone No. (703) 308-1234

Form PCT/ISA/210 (second sheet) (July 1998)
INTERNATIONAL SEARCH REPORT

Box I  Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. □ Claim Nos.:
   because they relate to subject matter not required to be searched by this Authority, namely:

2. □ Claim 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. □ Claim 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:
Please See Continuation 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.: 1-4 and 21

Remark on Protest □ The additional search fees were accompanied by the applicant’s protest.
□ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet(1)) (July 1998)
BOX II. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-4 and 21, drawn to a product comprised of the reaction product of a polyelectrolyte monomer and a specific binding pair member-substituted polyelectrolyte monomer and a kit containing the product.

Group II, claim(s) 5-20, drawn to a product comprised of an ionic conjugated polymer and a specific binding pair member-substituted polyelectrolyte, a method of using the product, and a sensor comprising the product.

Group III, claim(s) 22 and 23, drawn to a process of tuning the fluorescent properties of an ionic conjugated polymer.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the process of use of Group III is not limited to the use of the product of Group I. Group III uses a mixture of an ionic conjugated polymer and a biomolecule-containing polymeric reaction product. Groups I and II are unrelated for the reason that the different inventions involve chemically and functionally different moieties.

Continuation of B. FIELDS SEARCHED Item 3:
APS, CAS ONLINE
search terms: structure search, polyelectrolyte monomer, poly(diallyldimethylammonium), ligand, biomolecule, avidin, streptavidin, biotin, antibody, polypeptide, glycolipid, protein, enzyme, antigen, DNA, RNA, oligonucleotide, peptide, polyethyleneimine, polyacrylic, polyethylene glycol, specific binding