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(54) Title: DEVICES AND METHODS FOR TARGET MOLECULE CHARACTERIZATION

(57) Abstract: An system for recognition of a translocating polymeric target molecule includes a device having at least one constriction that is sized to permit translocation of only a single copy of the molecule. A pair of spaced apart sensing electrodes border the constriction, which may be a nanopore. The first electrode is connected to a first affinity element and the second electrode is connected to a second affinity element. Each affinity element may be connected to its corresponding electrode via one or more intermediary compounds, such as a linker molecule and/or an electrode attachment molecule. The first and second affinity elements are configured to temporarily form hydrogen bonds with first and second portions of the target molecule as the latter passes through the constriction. During translocation, the electrodes, affinity elements and first and second portions of the target molecule complete an electrical circuit and allow a measurable electrical current to pass between the first and second electrodes. The time-varying nature of this electrical current, and the specific affinity elements employed, allow one to characterize the target molecule.



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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - C12M 1/34 (2008.04) USPC - 435/287.1 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) USPC: 435/287.1 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC: 422/82.01; 435/287.1; 435/287.2; 435/6; 435/7.1 (text search) Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Electronic data bases: (USPT, PGPB, EPAB, JPAB); Google Scholar Search Terms: nanopore, nanopore electrode, DNA, sequencing, synthetic nanopore, electrode linker, affinity, methylene, guanidinium		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2005/0202444 A1 (ZHU). 15 September 2005 (15.09.2005), especially para [0004], [0005], [0008], [0013-0019], [0028-0031], [0035], [0040], [0042], sheet 1 Fig 1, sheet 2 Fig 2	1-63
Y	Oshiro et al. Complementary base-pair-facilitated electron tunneling for electrically pinpointing complementary nucleobases. IN: Proc. Nat. Acad. Sci. (USA) 3 January 2006 Vol 103 No 1 Pg: 10-14, especially abstract, pg 11 Fig 1, pg 14 right col para 1.	1-63
Y	Porath et al. Direct measurement of electrical transport through DNA molecules. IN: Nature 10 February 2000 Vol 403 Pg: 635-638. Abstract only.	1-14, 26-35, 48-63
Y	Shimmin et al. Polymer Size and Concentration Effects on the Size of Gold Nanoparticles Capped by Polymeric Thiols. IN: Langmuir 22 June 2004 Vol 20 No 13 Pg: 5613-5620. especially pg 5613 left col para 1.	4-6, 18, 19, 41, 57, 61, 62
Y	Schug et al. Noncovalent Binding between Guanidinium and Anionic Groups: Focus on Biological- and Synthetic-Based Arginine/Guanidinium Interactions with Phosph[on]ate and Sulf[on]ate Residues. IN: Chemical Reviews, 2005, Vol. 105, No. 1 Pg: 67-113. Especially pg 88 left col para 2 and pg 88 Fig 16	7, 8, 14, 36-63
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"O" document referring to an oral disclosure, use, exhibition or other means		
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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.
Y	Peng et al. Slowing down DNA translocation using magnetic and optical tweezers. IN: American Physical Society, APS March Meeting, 13-17 March 2006, abstract #N26.010. Available online at <<URL: http://meetings.aps.org/Meeting/MAR06/Event/42679 >> abstract only.	28-30, 50
Y	Walti et al. Direct Selective Functionalization of Nanometer-Separated Gold Electrodes with DNA Oligonucleotides. IN: Langmuir February 2003 Vol 19 No 4 Pg: 981 -984. Abstract only.	20
Y	Lee et al. GC base sequence recognition by oligo(imidazolecarboxamide) and C-terminus-modified analogues of distamycin deduced from circular dichroism, proton nuclear magnetic resonance, and methidiumpropylethylenediaminetetraacetate-iron(II) footprinting studies. IN: Biochemistry 27 April 1993 Vol 32 No 16 Pg: 4237-45. Abstract only	11