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(88) Date of publication of the international search report:

13 August 2020 (13.08.2020)

(54) Title: NUCLEOSIDES AND NUCLEOTIDES WITH 3'-HYDROXY BLOCKING GROUPS AND THEIR USE IN POLYNUCLEOTIDE SEQUENCING METHODS

(57) Abstract: Embodiments of the present disclosure relate to nucleotide and nucleoside molecules with acetal or thiocarbamate 3'-OH blocking groups. Also provided herein are methods to prepare such nucleotide and nucleoside molecules, and the uses of fully functionalized nucleotides containing the 3'-OH blocking group for sequencing applications.



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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
 INV. C07H19/06 C07H19/10 C07H19/16 C07H19/20 C07H21/00
 C12Q1/68
 ADD.
 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)
 C07H C12Q

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)
 EPO-Internal, CHEM ABS Data, 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	METZKER M L ET AL: "TERMINATION OF DNA SYNTHESIS BY NOVEL 3'-MODIFIED-DEOXYRIBONUCLEOSIDE 5'-TRIPHOSPHATES", NUCLEIC ACIDS RESEARCH, INFORMATION RETRIEVAL LTD, vol. 22, no. 20, 1 January 1994 (1994-01-01), pages 4259-4267, XP001068669, ISSN: 0305-1048	1,15-18, 26-42, 47-50
Y	the whole document page 4260; figure 2; compound 4 Base Addition Sequencing Scheme (BASS); page 4260; figure 1 ----- -/--	2-14, 43-46

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 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 31 March 2020	Date of mailing of the international search report 24/06/2020
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Gohlke, Pascale
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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/086926

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 02/29003 A2 (UNIV COLUMBIA [US]) 11 April 2002 (2002-04-11) cited in the application abstract; claims R is MOM (= proviso) or allyl -----	1-18, 26-50
Y	WO 2004/018497 A2 (SOLEXA LTD [GB]; MILTON JOHN [GB] ET AL.) 4 March 2004 (2004-03-04) cited in the application abstract; claims; figure 4 3'OR: R =CH ₂ N ₃ , CH ₂ SM _e , allyl, CH ₂ F; 3,4dimethoxybenzyloxymethyl; examples -----	1-18, 26-50
Y	WO 2009/054922 A1 (UNIV COLUMBIA [US]; JU JINGYUE [US] ET AL.) 30 April 2009 (2009-04-30) abstract definition of R ₁ ; figure 1 -----	1-18, 26-50
Y	WO 2014/139596 A1 (ILLUMINA CAMBRIDGE LTD [GB]) 18 September 2014 (2014-09-18) cited in the application abstract Definition of -O-CH(N ₃)R; figure 1A -----	1-18, 26-50
Y	WO 2012/162429 A2 (UNIV COLUMBIA [US]; JU JINGYUE [US]; WU JIAN [US]; LI ZENGMIN [US]) 29 November 2012 (2012-11-29) abstract Definition of 3'OR' wherein R' is azidomethyl or substituted or unsubstituted hydrocarbyl -----	1-18, 26-50
X	CN 105 315 318 A (UNIV SHANDONG) 10 February 2016 (2016-02-10) Compound of [0058] on page 5/6: R _{1a} and R _{2a} form together a six membered heterocyclyl; R _{1b} =R ₃ =H, R _{2b} =methyl ----- -/--	1,2,15, 16

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/086926

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>EP 0 104 857 A1 (BEECHAM GROUP PLC [GB]) 4 April 1984 (1984-04-04) Examples 1, 2: R1a and R2a form together a tetrahydrofuran-2-yl; R1b=R2b=R3=H; page 8; example 2 Examples 4, 5: R1a and R2a form together a tetrahydropyran-2-yl; R1b=R2b=R3=H; page 10 Example 7: R1a=ethyl; R1b=H; R2a=methyl; R2b=R3=H; page 11 Examples 16, 17: R1a=R1b=H; R2a=methyl; R2b=R3=H; page 17 Examples 19, 20: R1a=-CH2Cl; R1b=H; R2a=methyl; R2b=R3=H; page 19</p> <p style="text-align: center;">-----</p>	1-4,8, 15-18
X	<p style="text-align: center;">-----</p> <p>WALTER HEIDMANN ET AL: "Festphasensynthese von oligonucleotiden, 11. Verwendung eines neuartigen hydrophilen perlpolymerisats als trager", MAKROMOL. CHEM AND PHYSICS, vol. 181, no. 12, 1 December 1980 (1980-12-01), pages 2495-2506, XP055681106, ISSN: 0025-116X, DOI: 10.1002/macp.1980.021811207 Compound 6: R1a=methyl;R1b=H; R2b=methyl; R2a=R3=H; page 2497</p> <p style="text-align: center;">-----</p>	1,4,8
X	<p style="text-align: center;">-----</p> <p>YAMASHITA J-I ET AL: "Studies on antitumor agents. VII. Antitumor activities of O-alkoxyalkyl de rivatives of 2'-deoxy-5-trifluoromethyluridine", CHEMICAL AND PHARMACEUTICAL BULLETIN, PHARMACEUTICAL SOCIETY OF JAPAN, JP, vol. 35, no. 6, 1 January 1987 (1987-01-01), pages 2373-2381, XP002270561, ISSN: 0009-2363 tables I, III; compounds 1, 3, 21</p> <p style="text-align: center;">-----</p>	1,4,8, 15-18

INTERNATIONAL SEARCH REPORT

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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 all searchable 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.:

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.:

1-18(completely); 26-50(partially)

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: 1-18(completely); 26-50(partially)

Nucleosides and nucleotides with a 3'-hydroxy acetal blocking group, said nucleosides or nucleotides covalently attached to a detectable label, a sequencing method using them as well as a kit comprising them.

2. claims: 19-25(completely); 26-50(partially)

Nucleosides and nucleotides with a 3'-hydroxy acetal thiocarbamate blocking group, said nucleosides or nucleotides covalently attached to a detectable label, a sequencing method using them as well as a kit comprising them.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2019/086926

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