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(54) Title: GOLD-MEDIATED NUCLEIC ACID HYBRIDIZATION

(57) Abstract: The present disclosure provides a gold-containing compound including an aurous gold atom and a nucleic acid strand that forms a toehold-stem-loop structure, in which the aurous gold atom is complexed with a mismatched pair of residues in the stem portion of the nucleic acid strand. The disclosure also provides a gold-containing double-stranded nucleic acid including an aurous gold coordinated between a first nucleobase and a mismatching second nucleobase. Related methods of increasing stability of a nucleic acid duplex, regulating an aurous-gold-catalyzed reaction, detecting an oligonucleotide, and detecting aurous gold in a substance are additionally provided.



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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.: 7, 11, 16-20
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:

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 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.:

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.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2020/021716

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 9206419 B2 (CALIFORNIA INSTITUTE OF TECHNOLOGY et al.) 08.12.2015, abstract, claims	1-6, 8-10, 12-15, 21-25
A	ENNIFAR Eric et al. "A crystallographic study of the binding of 13 metal ions to two related RNA duplexes." Nucleic acids research, 2003, 31(10): 2671-2682, doi: 10.1093/NAR/GKG350, pp. 2679-2680	1-6, 8-10, 12-15, 21-25
X, P	GREEN Sydnee A. et al. "Regulating Transition-Metal Catalysis through Interference by Short RNAs." Angewandte Chemie, 2019 (First published: 16 July 2019), 131: 1-6, doi: 10.1002/anie.201905333, abstract, pp. 1-4, fig. 1	1-6, 8-10, 12-15, 21-25

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2020/021716

A. CLASSIFICATION OF SUBJECT MATTER		
<i>C07H 23/00 (2006.01)</i> <i>C12Q 1/6816 (2018.01)</i> <i>C12N 15/115 (2010.01)</i>		
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)		
C12Q 1/68, C12Q 1/6813, C12Q 1/6816, C07H 21/00, C07H 23/00, C12N 15/11, C12N 15/115		
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)		
EAPATIS, ESPACENET, PatSearch (RUPTO internal), Information Retrieval System of FIPS, USPTO, PATENTSCOPE, Google Patents, E-Library, PubMed		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WRAGG Darren et al. "On the Mechanism of Gold/NHC Compounds Binding to DNA G-Quadruplexes: Combined Metadynamics and Biophysical Methods." <i>Angewandte Chemie</i> , 2018, 57(44): 14524-14528 (1-6), doi: 10.1002/anie.201805727, pp. 2-3, fig. 2, section "Supplementary Information Available", pp. 3-4	4, 6, 21-25
Y		1-3, 5, 8-10, 12-15
Y	WO 2015/116502 A1 (THE REGENTS OF THE UNIVERSITY OF CALIFORNIA et al.) 06.08.2015, abstract, claims, examples 1, 2, fig. 1, par. [028]	1-3, 8-10, 12-15
Y	FEREIDONNEZHAD Massod et al. "(Benzyl isocyanide) gold (I) pyrimidine-2-thiolate complex: Synthesis and biological activity." <i>Applied Organometallic Chemistry</i> , 2018, 32(3): e4200, doi: 10.1002/aoc.4326, abstract, p. 2	5
A	US 8710199 B2 (CALIFORNIA INSTITUTE OF TECHNOLOGY et al.) 29.04.2014, abstract, claims	1-6, 8-10, 12-15, 21-25
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"D" document cited by the applicant in the international application	"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
"E" earlier document but published on or after the international filing date	"&"	document member of the same patent family
"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		
Date of the actual completion of the international search	Date of mailing of the international search report	
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Name and mailing address of the ISA/RU: Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37	Authorized officer T. Babakova Telephone No. +7 (495) 531-64-81	