

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 018123-00104	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/US2022/076047	International filing date (<i>day/month/year</i>) 7 September 2022 (07-09-2022)	(Earliest) Priority Date (<i>day/month/year</i>) 9 September 2021 (09-09-2021)
Applicant GAS TECHNOLOGY INSTITUTE		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed
☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (see Box No III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 1
☒ as suggested by the applicant
☐ as selected by this Authority, because the applicant failed to suggest a figure
☐ as selected by this Authority, because this figure better characterizes the invention
b. ☐ none of the figures is to be published with the abstract

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International application No
PCT/US2022/076047

A. CLASSIFICATION OF SUBJECT MATTER		
INV.	C10L3/12	C07C1/02
	C07C9/10	C01B3/38
		C10K3/02
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)		
C10L C07C C01B C10K		
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, 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	WO 2004/076600 A1 (JAPAN GAS SYNTHESIZE LTD [JP]; ASAMI KENJI [JP] ET AL.) 10 September 2004 (2004-09-10)	1, 2, 5-12, 16-18, 20, 21
Y	paragraphs [0003], [0029], [0030], [0176], [0184] - [0187] figure 1; examples	1, 4, 13-16, 19, 21, 22
X	WO 2005/037962 A1 (JAPAN GAS SYNTHESIZE LTD [JP]; FUJIMOTO KAORU [JP] ET AL.) 28 April 2005 (2005-04-28)	1, 5, 6, 8-12, 16-22
Y	figure 2; examples	1-4, 13-16, 19, 21, 22
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☒ 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		Date of mailing of the international search report
9 December 2022		19/12/2022
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 Keipert, Olaf

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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.
X	CN 110 846 096 A (UNIV TIANJIN) 28 February 2020 (2020-02-28) paragraphs [0003] - [0005] claims; examples -----	13-15
Y	KR 2019 0134236 A (KOREA RES INST CHEMICAL TECH [KR]) 4 December 2019 (2019-12-04) paragraph [0119]; claims; examples -----	1-4, 13-16, 19
Y	EP 0 146 165 A2 (SHELL INT RESEARCH [NL]) 26 June 1985 (1985-06-26) claims 1, 5, 6, 12 -----	21, 22

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Information on patent family members

International application No

PCT/US2022/076047

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2004076600	A1	10-09-2004	NONE

WO 2005037962	A1	28-04-2005	CN 1867652 A 22-11-2006
		JP WO2005037962 A1	28-12-2006
		WO 2005037962 A1	28-04-2005

CN 110846096	A	28-02-2020	NONE

KR 20190134236	A	04-12-2019	NONE

EP 0146165	A2	26-06-1985	AU 562768 B2 18-06-1987
		CA 1228345 A	20-10-1987
		EP 0146165 A2	26-06-1985
		JP H0640962 B2	01-06-1994
		JP S60147244 A	03-08-1985
		NZ 210549 A	29-05-1987
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		ZA 849705 B	31-07-1985
