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Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

Published:

— with international search report (Art. 21(3))  
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

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

20 June 2024 (20.06.2024)

(54) Title: CYANINE-BASED FLUOROPHORES

(57) Abstract: The present application provides compounds and methods for structure-inherent targeting and intraoperative imaging of cancerous tumors.



WO 2024/107699 A3

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 23/79600

## A. CLASSIFICATION OF SUBJECT MATTER

IPC - INV. C07D 209/04, C07D 209/02, C07D 209/14, C09B 23/06 (2023.01)  
ADD. C07D 209/10 (2023.01)

CPC - INV. C07D 209/04, C07D 209/02, C07D 209/14, C09B 23/06

ADD. C07D 209/10

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)

See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History document

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	"Pubchem CID 656411", Create date: 15 June 2005 (15.06.2005), entire document, especially page 2, compound listed	1, 5
A	US 2022/0259434 A1 (DIC Corporation), 18 August 2022 (18.08.2022), entire document, especially para[0014]-[0019], [0102]	1, 5
A	WO 2019/032683 A2 (Board of Trustees of Michigan State University), 14 February 2019 (14.02.2019), entire document, especially Figure 5	1, 5
A	US 10,588,829 B2 (Inter-Med, Inc.), 17 March 2020 (17.03.2020), entire document, especially col 18, ln 60, compound listed	1, 5
A	US 2020/0237670 A1 (Memorial Sloan Kettering Cancer Center), 30 July 2020 (30.07.2020), entire document, especially Figure 1D	1, 5
A	US 9,151,735 B2 (Ewha University-Industry Collaboration Foundation), 06 October 2015 (06.10.2015), entire document, especially Figure 1, Compound 3a	1, 5

☐ 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

"D" document cited by the applicant in the international application

"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

19 January 2024

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APR 19 2024

Name and mailing address of the ISA/US

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 23/79600

## 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.: 8-10, 12-14, 17-21, 23-25, 27-31  
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 supplemental box---

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.:  
1, 5

### 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 23/79600

## Box III: lack of unity

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 searched, the appropriate additional search fees must be paid.

Group I+: Claims 1-7, 11, 15-16, 22, and 26 are directed to a compound having a structure of Formula (I) as seen in instant claim 1. Claim 1 will be searched to the extent that it encompasses the first species of claim 1, represented by a compound of Formula (I) or a pharmaceutically acceptable salt thereof, wherein: Y is CH<sub>2</sub>; X<sub>1</sub> is H; X<sub>2</sub> is H; R<sub>1</sub> is C<sub>1</sub> alkyl; R<sub>2</sub> is C<sub>1</sub> alkyl. It is believed that claims 1 and 5 read on this first named invention, and thus these claims will be searched without fee. This first named invention has been selected based on the guidance set forth in section 10.54 of the PCT International Search and Preliminary Examination Guidelines. Applicant is invited to elect additional compounds of claim 1, wherein each additional compound elected will require one additional invention fee. Applicants must specify the claims that encompass any additionally elected compound. Applicants must further indicate, if applicable, the claims which encompass the first named invention, if different than what was indicated above for this group. Failure to clearly identify how any paid additional invention fees are to be applied to the '+' group(s) will result in only the first claimed invention to be searched. Additionally, an exemplary election wherein different actual variables are selected is suggested. An exemplary election would be a compound of Formula (I) wherein Y is CH<sub>2</sub>; X<sub>1</sub> is H; X<sub>2</sub> is H; R<sub>1</sub> is C<sub>2</sub> alkyl; R<sub>2</sub> is C<sub>1</sub> alkyl (i.e., claims 1, 5).

The group of inventions listed above 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:

## Special Technical Features:

Each invention in Group I+ includes the technical feature of a unique compound of Formula (I), which is not required by any other invention of Group I+.

## Common Technical Features:

The inventions of Groups I+ share the technical feature of a compound of Formula (I).

These shared technical features, however, do not provide a contribution over the prior art as being anticipated by a document entitled "Pubchem CID 656411" (hereinafter 'Pubchem-411'). Pubchem-411 teaches a compound of Formula (I) as seen in instant claim 1 or a pharmaceutically acceptable salt thereof, wherein: Y is CH<sub>2</sub>; X<sub>1</sub> is H; X<sub>2</sub> is H; R<sub>1</sub> is C<sub>1</sub> alkyl; R<sub>2</sub> is C<sub>1</sub> alkyl (see page 2, compound listed).

As said compound was known in the art, these cannot be considered special technical features that would otherwise unify the inventions of Groups I+. The inventions of Group I+ thus lack unity under PCT Rule 13.

## Item 4 (cont.):

Claims 8-10, 12-14, 17-21, 23-25, and 27-31 are unsearchable because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).