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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:
28 March 2013

(54) Title: MODULAR SUPRAMOLECULAR APPROACH FOR CO-CRYSTALLIZATION OF DONORS AND ACCEPTORS INTO ORDERED NETWORKS

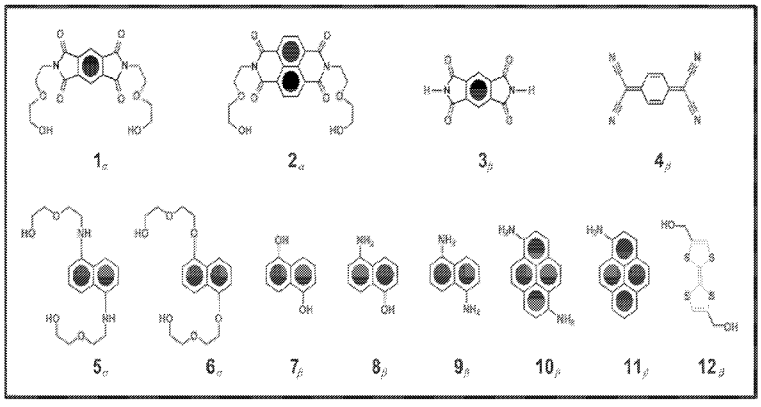

FIG 1

(57) Abstract: Organic charge-transfer (CT) co-crystals in a mixed stack system are disclosed, wherein a donor molecule (D) and an acceptor molecule (A) occupy alternating positions (DADADA) along the CT axis. A platform is provided which amplifies the molecular recognition of donors and acceptors and produces co-crystals at ambient conditions, wherein the platform comprises (i) a molecular design of the first constituent (α- complement), (ii) a molecular design of the second compound (β-complement), and (iii) a solvent system that promotes co-crystallization.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/038896

A. CLASSIFICATION OF SUBJECT MATTER

C07D 487/04(2006.01)i, H01L 51/00(2006.01)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)
C07D 487/04; C07D 403/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal), Google Scholar & Keywords: supramolecule, ferroelectric, co-crystal, charge transfer complexation, polarization

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	HORIUCHI S. et al., 'Above Room Temperature Ferroelectricity in a Single Component Molecular Crystal', Nature, 2010, Vol. 463, pages 789-793 See abstract; figure 1	3,15
A	HORIUCHI S. et al., 'Organic Ferroelectrics', Nature Material, 2008, Vol. 7, pages 357-366 See abstract; figure 3 and 4	3,15
A	WO 2009-109781 A2 (CRYSOPTIX K.K. et al.) 11 September 2009 See abstract; claim 7	3,15
A	FUJITSUKA M. et al., 'Electron Transfer in the Supramolecular Donor-Acceptor Dyad of Zinc Porphycene', J. Phys. Chem. A, 2009, Vol. 113, pages 3330-3335 See abstract; figure 1	3,15

☐ 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 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
31 JANUARY 2013 (31.01.2013)	**01 FEBRUARY 2013 (01.02.2013)**

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/038896

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.: 1-2, 4-14, 16
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:

See extra sheet

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:

1. ☐ As all required addtional 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 fee, this Authority did not invite payment of any additional fee.

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.

Continuation of Box No. II

Clams 1-2, 4-14, 16 are too unclear to make meaningful search because following functional statements do not enable the skilled person to determine which technical features are necessary to perform the stated function(s):
An organic charge-transfer co-crystal consisting α-complement and β-complement, wherein β-complement is incorporated into the α-complement through molecular linkage (adaptive intermolecular linkages) in a solvent system to form a co-crystalline supramolecular network.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/038896

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2009-109781 A2	11.09.2009	EP 2260035 A2	15.12.2010
		JP 2011-513376 A	28.04.2011
		US 2011-0149393 A1	23.06.2011
		WO 2009-109781 A3	11.09.2009