

**PATENT COOPERATION TREATY**

**PCT**

**INTERNATIONAL SEARCH REPORT**

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 18258KUr00WO/dw	<b>FOR FURTHER ACTION</b> see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/EP2018/073550	International filing date ( <i>day/month/year</i> ) 31 August 2018 (31-08-2018)	(Earliest) Priority Date ( <i>day/month/year</i> ) 31 August 2017 (31-08-2017)
Applicant  KATHOLIEKE UNIVERSITEIT LEUVEN		

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 5 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 43.6*bis*(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:

PHASE TRANSITION THIN FILM DEVICE

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. 6  
 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

## Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)

The disclosed device comprises a thin film layer (4) of a phase transition material disposed over a substrate (2), and a confinement layer (3) adjacent to the thin film layer. The thin film layer has first and second in-plane lattice parameters and an out-of-plane lattice parameter when undergoing the phase transition, and the confinement layer has first and second in-plane layer lattice parameters and an out-of-plane layer lattice parameter. The confinement layer lattice parameters are within a range which allows to control the onset of and/or block the phase transition.

INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2018/073550

A. CLASSIFICATION OF SUBJECT MATTER  
INV. H01L45/00 H01L49/00 H03H9/42 G01L9/00  
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)  
H01L H03H G01L

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, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BAI F ET AL: "Epitaxially induced high temperature (>900K) cubic-tetragonal structural phase transition in BaTiO3 thin films", APPLIED PHYSICS LETTERS, vol. 85, no. 18, 1 November 2004 (2004-11-01), pages 4109-4111, XP012063192, ISSN: 0003-6951, DOI: 10.1063/1.1812579 the whole document ----- -/--	1-11,13, 26,30, 31, 33-35,37

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  17 December 2018	Date of mailing of the international search report  04/01/2019
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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  Köpf, Christian
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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2018/073550

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DILLEMANS L ET AL: "Evidence of the metal-insulator transition in ultrathin unstrained V2O3 thin films", APPLIED PHYSICS LETTERS, vol. 104, no. 7, 071902, 18 February 2014 (2014-02-18), XP012182087, ISSN: 0003-6951, DOI: 10.1063/1.4866004 cited in the application page 1 page 3, right-hand column - page 4; figure 5	1-6, 8-11, 20,23, 26,30, 33-37
X	----- LI J ET AL: "Controlling metal-insulator transition in the hetero-epitaxial VO2/TiO2 bilayer grown on Al2O3", JOURNAL OF CRYSTAL GROWTH, vol. 312, no. 22, 21 August 2010 (2010-08-21), pages 3287-3291, XP027407485, ISSN: 0022-0248 sections 1, 3.2, 4; figure 6	1-6,8, 20,26, 30,31, 33-37
X	----- US 9 627 490 B1 (EOM CHANG-BEOM [US] ET AL) 18 April 2017 (2017-04-18)  column 4, line 15 - column 9, line 4; figures 1-7A	1-6,8, 26,30, 31,33-37
X	----- WO 2013/119617 A1 (HARVARD COLLEGE [US]) 15 August 2013 (2013-08-15)  paragraphs [0014] - [0025], [0031]; figure 1	1-6,15, 16,26, 30-37
X	----- TIWARI A ET AL: "Strain-induced tuning of metal-insulator transition in NdNiO3", APPLIED PHYSICS LETTERS, vol. 80, no. 21, 27 May 2002 (2002-05-27), pages 4039-4041, XP012031048, ISSN: 0003-6951, DOI: 10.1063/1.1480475 the whole document	1-3,8, 26,30, 33-36

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2018/073550

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 9627490	B1 18-04-2017	US 9627490 B1	18-04-2017
		US 2018122910 A1	03-05-2018
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WO 2013119617	A1 15-08-2013	US 2014375417 A1	25-12-2014
		WO 2013119617 A1	15-08-2013
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