



- (51) **International Patent Classification:**  
C23C 18/08 (2006.01) C23C 18/12 (2006.01)
- (21) **International Application Number:**  
PCT/IN2015/000117
- (22) **International Filing Date:**  
5 March 2015 (05.03.2015)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**  
612/DEL/2014 5 March 2014 (05.03.2014) IN
- (71) **Applicant: COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH [IN/IN];** Anusandhan Bhawan, Rafi Marg, New Delhi 110 001 (IN).
- (72) **Inventors: LAKSHMI VARA BHAGAVATULA, Prasad;** National Chemical Laboratory, Homi Bhabha Road, Pune 411008 (IN). **BUSUPALLI, Balanagulu;** National Chemical Laboratory, Homi Bhabha Road, Pune 411008 (IN).
- (74) **Agents: RAE, Konpal et al.;** Lakshmikumaran & Sridharan, B6/10, Safdarjung Enclave, New Delhi 110 029 (IN).
- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,

DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**Declarations under Rule 4.17:**

— of inventorship (Rule 4.17(iv))

**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:**

19 November 2015



(54) **Title:** A PROCESS FOR SYNTHESIS OF SINGLE LAYER METAL SHEETS

(57) **Abstract:** A novel solution process for the preparation of at least one atom thick layer of a metal on a substrate in the form of nanosheets is disclosed. Further, a process for the preparation of Ni<sub>3</sub>S<sub>2</sub> and Ni<sub>3</sub>S<sub>2</sub>-Ni nanosheets exhibiting ferromagnetic behaviour at room temperature is disclosed.

INTERNATIONAL SEARCH REPORT

International application No  
PCT/IN2015/000117

A. CLASSIFICATION OF SUBJECT MATTER  
INV. C23C18/08 C23C18/12  
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)  
C23C  
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	EP 0 514 073 A2 (JOHNSON MATTHEY PLC [GB]) 19 November 1992 (1992-11-19) the whole document	1-11
X	DE 44 05 423 A1 (CERDEC AG [DE]) 24 August 1995 (1995-08-24) the whole document	1-11
X,P	BALANAGULU BUSUPALLI ET AL: "Ultrathin Sheets of Metal or Metal Sulfide from Molecularly Thin Sheets of Metal Thiolates in Solution", CHEMISTRY OF MATERIALS, vol. 26, no. 11, 10 June 2014 (2014-06-10) , pages 3436-3442, XP055216663, ISSN: 0897-4756, DOI: 10.1021/cm5006949 the whole document	1-11
	----- -/--	

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&amp;" document member of the same patent family</p>
---	---

Date of the actual completion of the international search  28 September 2015	Date of mailing of the international search report  08/10/2015
--	--

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  Ramos Flores, Cruz
--	--

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/IN2015/000117

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 668 265 A1 (CERDEC AG) 23 August 1995 (1995-08-23) the whole document -----	1-11

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IN2015/000117

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0514073	A2	19-11-1992	
		AT 124678 T	15-07-1995
		CN 1066863 A	09-12-1992
		CZ 287025 B6	16-08-2000
		DE 69203291 D1	10-08-1995
		DE 69203291 T2	21-12-1995
		DK 0514073 T3	21-08-1995
		EP 0514073 A2	19-11-1992
		ES 2073866 T3	16-08-1995
		HK 179795 A	01-12-1995
		HU 215017 B	28-08-1998
		JP 3119390 B2	18-12-2000
		JP H05163576 A	29-06-1993
		TR 25693 A	01-09-1993
		US 5281635 A	25-01-1994
		US 5401535 A	28-03-1995
		US 5744245 A	28-04-1998
		US 6013798 A	11-01-2000
DE 4405423	A1	24-08-1995	NONE
EP 0668265	A1	23-08-1995	
		EP 0668265 A1	23-08-1995
		ES 2105787 T3	16-10-1997
		HK 1000596 A1	09-04-1998
		JP H07252261 A	03-10-1995
		SG 48051 A1	17-04-1998
		US 5705664 A	06-01-1998