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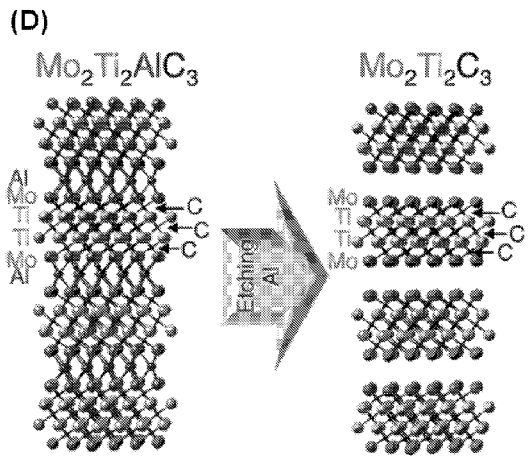
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(54) **Title**: TWO-DIMENSIONAL, ORDERED, DOUBLE TRANSITION METALS CARBIDES HAVING A NOMINAL UNIT CELL COMPOSITION M'2M"NXN+1

FIG. 6



(57) **Abstract**: The present disclosure is directed to compositions comprising at least one layer having first and second surfaces, each layer comprising: a substantially two-dimensional array of crystal cells, each crystal cell having an empirical formula of $M'_2M"_nX_{n+1}$, such that each X is positioned within an octahedral array of M' and M"; wherein M' and M" each comprise different Group IIIB, IVB, VB, or VIB metals; each X is C, N, or a combination thereof; n = 1 or 2; and wherein the M' atoms are substantially present as two-dimensional outer arrays of atoms within the two-dimensional array of crystal cells; the M" atoms are substantially present as two-dimensional inner arrays of atoms within the two-dimensional array of crystal cells; and the two dimensional inner arrays of M" atoms are sandwiched between the two- dimensional outer arrays of M' atoms within the two-dimensional array of crystal cells.

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CPC - C01B 31/34, C01B 31/303
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)
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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)
PatBase, Google Patents, Google Scholar
Search terms used: TWO-DIMENSIONAL ORDERED DOUBLE TRANSITION METALS CARBIDES NOMINAL UNIT CELL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y -- A	US 2014/0162130 A1 (BARSOUM et al.) 12 June 2014 (12.06.2014); para [0007]-[0012], [0014], [0016]-[0022], [0024], [0034], [0089], [0121]-[0122], [0171], [0193], [0196]-[0197], [0201]	1-5, 7-8, 11-24, 26-27, 30-44 --- 6, 9-10, 25, 28-29
Y -- A	RUDY E., "Crystal structure of Ta2VC2", Journal of the Less-Common Motals [online], January 1970 (01.1970) [retrieved on 2016-11-30], volume 20, issue 1, retrieved from the Internet: <DOI: 10.1016/0022-5088(70)90035-4>, pp. 49-55; see entire document, especially pg 49-51, 53-54; Figs. 1-2	1-5, 7-8, 11-24, 26-27, 30-44 --- 6, 9-10, 25, 28-29
Y -- A	SRINIVASAN V., "Batteries for Advanced Transportation Technologies (BATT) Program. The fourth quarter 2014 FY report", Berkeley National Laboratory Document [online], 19 November 2014 (19.11.2014) [retrieved on 2016-11-30], retrieved from the Internet: <http://bmr.lbl.gov/wp-content/uploads/sites/3/battfiles/reports/BATT_2014_4th_Quarterly_Report.pdf>, 74 pp.; see entire document, especially pg 23-24	2-3, 7-8, 21, 23, 26-27 --- 6, 9-10, 25, 28-29
Y	NAN C.W. et al., "Percolation phenomena in niobium-doped TiC1-x", Materials Science and Engineering B-Solid State Materials for Advanced Technology [online], February 1991 (02.1991) [retrieved on 2016-11-30], volume 7, issue 4, retrieved from the Internet: <DOI: 10.1016/0921-5107(91)90005-G>, pp. 283-286; see entire document, especially pg 283, 285	18, 37
Y	FINKEL P. et al., "Magnetotransport properties of the ternary carbide Ti3SiC2: Hall effect, magnetoresistance, and magnetic susceptibility", Physical Review B [online], 15 January 2002 (15.01.2002) [retrieved on 2016-11-30], volume 65, issue 3, retrieved from the Internet: <DOI: 10.1103/PhysRevB.65.035113>, 4 pp.; see entire document, especially pg 1-2	19, 38

☒ Further documents are listed in the continuation of Box C. ☐

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

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INTERNATIONAL SEARCH REPORT

International application No.
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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.
A	ETTMAYER P. et al., "Crystal structure of Cr3(C,N)2 AND Cr2VC2", Monatshefte fur Chemie und Verwandte Teile Anderer Wissenschaften [online], July 1966 (07.1966) [retrieved on 2016-11-30], volume 97, issue 4, retrieved from the Internet: <DOI: 10.1007/BF00903577>, pp. 1258 -1262; see entire document, especially pg 1258	6, 9-10, 25, 28-29
A	JIN Y. et al., "Synthesis of VC-Cr3C2 Nanocomposite Powders by Carbothermal Reduction", Nanoscience and Nanotechnology Letters [online], October 2012 (10.2012) [retrieved on 2016-11-30], volume 4, number 10, pp. 1028-1030; Abstract retrieved from the Internet: <http://www.ingentaconnect.com/contentone/asp/nnl/2012/00000004/00000010/art00012>; 1 pg; see entire document	1-44