

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
27 December 2007 (27.12.2007)

PCT

(10) International Publication Number
WO 2007/148214 A3

(51) International Patent Classification:
B24D 3/14 (2006.01) *C09K 3/14* (2006.01)
B24D 3/16 (2006.01)

(21) International Application Number:
PCT/IB2007/001695

(22) International Filing Date: 22 June 2007 (22.06.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2006/05214 23 June 2006 (23.06.2006) ZA

(71) Applicant (for all designated States except US): **ELEMENT SIX (PRODUCTION) (PTY) LTD** [ZA/ZA]; Debid Road, Nuffield, 1559 Springs (ZA).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **CAN, Antionette** [ZA/ZA]; 29 Lotus Road, 1459 Sunward Park (ZA). **DAVIES, Geoffrey John** [GB/ZA]; 36 Boundary Road, Linden Extension, 2194 Randburg (ZA). **MYBURGH, Johannes Lodewikus** [ZA/ZA]; 9 Helderkruin Gardens, 39 Witteberg Street, 1724 Helderkruin (ZA).

(74) Agents: **SPOOR & FISHER** et al.; P O Box 454, 0001 Pretoria (ZA).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, 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, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:
22 May 2008

(54) Title: TRANSFORMATION TOUGHENED ULTRAHARD COMPOSITE MATERIALS

(57) Abstract: An ultrahard composite material comprises ultrahard particles dispersed in a phase transformable matrix material. The phase transformable matrix material is a single material including all possible crystallographic phases thereof, that comprises at least one component that is metastable at or near ambient temperature and the metastable component is capable of undergoing Martensitic phase transformation when the composite material is placed under stress, for example stress with a significant shear component. The stability of the matrix material at ambient temperature, and its ability to undergo phase transformation, is enhanced or optimised by ensuring that the matrix material comprises predominantly the crystallographic phase that is the metastable phase and/or by providing the matrix material in a nano grain size range that ensures it is metastable at or near ambient temperature. The metastable phase present will transform when stresses are applied during applications such as the machining of hard materials and the like.



WO 2007/148214 A3

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2007/001695

A. CLASSIFICATION OF SUBJECT MATTER
INV. B24D3/14 B24D3/16 C09K3/14

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)
B24D C09K

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 practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2006/032984 A (ELEMENT SIX PTY LTD [ZA]; CAN ANTIONETTE [ZA]; MOCHUBELE ANNA EMELA [Z]) 30 March 2006 (2006-03-30) claims 1-38; examples 9,10 -----	1-21
X	WO 2006/032982 A (ELEMENT SIX PTY LTD [ZA]; CAN ANTIONETTE [ZA]; MOCHUBELE ANNA EMELA [Z]) 30 March 2006 (2006-03-30) claims 1-38; figure 6; examples 10-12 -----	1

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 document 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.
- *Z* document member of the same patent family

Date of the actual completion of the international search

3 March 2008

Date of mailing of the international search report

11/03/2008

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Wengeler, Heinz

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2007/001695

Patent document cited in search report	A	Publication date	Patent family member(s)	Publication date			
WO 2006032984	A	30-03-2006	AU 2005286166 A1	30-03-2006			
			AU 2005286168 A1	30-03-2006			
			CA 2564741 A1	30-03-2006			
			CA 2564748 A1	30-03-2006			
			CN 1954042 A	25-04-2007			
			CN 1954043 A	25-04-2007			
			EP 1794251 A1	13-06-2007			
			EP 1794252 A2	13-06-2007			
			WO 2006032982 A1	30-03-2006			
			KR 20070057176 A	04-06-2007			
			KR 20070083557 A	24-08-2007			
			WO 2006032982	A	30-03-2006	AU 2005286166 A1	30-03-2006
AU 2005286168 A1	30-03-2006						
CA 2564741 A1	30-03-2006						
CA 2564748 A1	30-03-2006						
CN 1954042 A	25-04-2007						
CN 1954043 A	25-04-2007						
EP 1794251 A1	13-06-2007						
EP 1794252 A2	13-06-2007						
WO 2006032984 A2	30-03-2006						
KR 20070057176 A	04-06-2007						
KR 20070083557 A	24-08-2007						