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石犬通訊

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Diamonds

Are Diamonds a girls' best friend - how about a man's?

De Beers reported a 35% rise in its average per-carat price for rough stones for the first half of 2011. According to Bloomberg, prices increased 49% over that same period. Some expect the growth from demand in China and India to drive the price up even further.

Diamond is made of carbon that has crystallized to a specific structure under high pressure and high temperature. It is the hardest known natural material and its lustre and sparkle come from its high refractive index. These special properties, prompted diamond producer De Beers to come up with the most iconic marketing slogan of the last century: "A Diamond is Forever" symbolizing love and romance.

As well as being a sparkling accessory, diamond has various important industrial uses. About 20% of mined diamonds are gem quality; the remaining 80% are for industrial use. Even that is still insufficient to meet industrial demand and about 90% of the diamonds used for such purposes are synthetic in origin. Since diamond is the hardest mineral known to man, its primary use is for grinding and cutting. For example, exploration drilling uses diamond grit drill bits to cut through hard rock. Diamonds are also used to cut, polish and shape other minerals, including diamond itself.

The word diamond is thought to originate from a combination of adamant and the old Greek work for force (deme), meaning they are unbreakable or invincible.

Geological Deposition

Diamonds may last forever in a human time scale but they are not the most geologically stable mineral since they slowly (negligible in ambient conditions) revert to graphite (which is used as pencil lead) over geological time. Diamonds are formed at depth under great pressures and temperatures and comprise part of complex igneous materials that are brought rapidly towards the surface of the earth by violent and deep volcanic eruptions. In contrast, graphite is formed from carbon but under lower pressures and temperatures compared to diamond.

The eruptions responsible for forming diamonds create a vertical geological structure called a volcanic pipe: those originating from deep underground (150 - 450 km depth) are called Kimberlite pipes (named after the town of Kimberley in South Africa). Shallower pipes (about 150km deep which act more destructively on



鑽石

鑽石是女士們的最好朋友，對男士來說又是否一樣呢？

戴比爾斯(De Beers)於2011年上半年的毛坯鑽石平均每卡價格錄得35%增長，而根據彭博(Bloomberg)的一項統計，價格的同

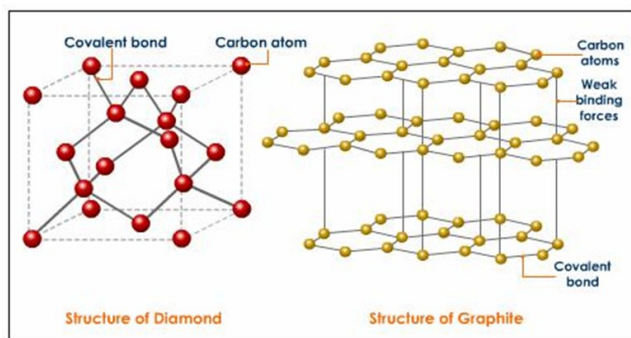
期升幅更達49%。隨着來自中國和印度的需求增加，有人估計價格會進一步上揚。

鑽石(又稱為金剛石)是在高壓和高溫之下碳結晶化至某一特定結構而形成的物質，是已知最堅硬的天然物質。由於鑽石的折射率高，因此表面會閃閃生輝。就是鑽石的種種特質，鑽石生產商De Beers創作出上世紀最膾炙人口的宣傳標語「A Diamond is Forever(鑽石恆久遠)」，寓意堅貞的愛情。

鑽石除了可製成耀眼奪目的鑽飾以外，還有各種重要的工業用途。大約兩成開採得來的鑽石屬於寶石級數，另外的八成則用作工業用途。即便如此，供應仍然不敷工業應用，而且大約九成用於工業用途的鑽石都是人造的。作為現存所知世上最堅硬的礦物，鑽石的主要用途是琢磨和切割。例如勘探鑽井用於鑿開硬石的就是鑽石岩石鑿孔器。另外，鑽石同時亦用於切割、打磨及塑造其他礦物，包括鑽石本身。

有人認為英語中的鑽石(diamond)源於「堅固」(adamant)和古希臘語中代表力量(deme)二字的合成，有堅不可摧及無敵的意思。

地質分佈



Structure of diamond is 3 dimensional while structure of graphite is 2 dimensional (sheet like) which are connected by weak binding forces
鑽石的架構是三維的；石墨的架構則是二維的(塊狀)再由微弱的結合力量連接起來

以人類的時間標準而言，鑽石或許永恆不變，可是它從地質角度來說卻並非是最穩定的物質，因為它會隨著時間慢慢(在周遭環境條件下影響極微)還原至石墨礦形態(即鉛筆所用的鉛芯)。鑽石和石墨礦形成的主要分別，在於它們形成時的速度。鑽石於地球深處形成，由深度的猛烈火山爆發噴射出地球表面混在的複雜火成物

質中。相反，石墨礦則是倚靠從地幔以緩慢的速度帶到地表的碳而形成。

火山爆發形成鑽石，在過程中會開出一道火山管 - 一種垂直的地質結構：位於地底深處(150至450公里深)的火山管稱為金百利岩管(因南非

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the rocks above) are called Lamproite pipes. Hence rocks formed in these pipe structures are respectively called Kimberlites and Lamproites. Most of the mined diamonds are from Kimberlites which can only be found in ancient rock formed over 2.5 billion years ago. In contrast, Lamproites can be found in much younger rock (as young as 56,000 years ago).

Volcanic pipes are often difficult to identify and diamond exploration is usually done initially by aerial surveys (high-altitude magnetic surveys by aircraft). Thereafter, extensive exploration and drilling is done on the ground. Garnet is one of the markers (trace-elements) for kimberlite exploration.



Left: In January 1905, the largest rough diamond – Cullinan (3106.75ct) was discovered in South Africa. Below: Glass replica of Cullinan I (530.4ct), also known as Great Star of Africa, is the largest polished diamond from the Cullinan. Above: Discovered in 1985, the Golden Jubilee (545.67ct) is currently the largest polished diamond surpassing the Cullinan I.

左：史上最大的毛鑽庫利南（3106.75ct）於1905年1月在南非發現。下：天璽 I（530.4ct）的玻璃複製品，也稱為大非洲之星，是從庫利南切割出最大的鑽石。上：金色陛下（545.67ct）於1985年發現，超越了天璽 I 成為目前最大的拋光鑽石



金百利城而得名)；位於較淺位置(大約 150 公里深，對上方岩石破壞力較大)的火山管則稱為金雲火山岩管，而出自這些火山管的岩石就因此名為金百利岩和金雲火山岩。大部分開採得來的鑽石是金百利岩，只可於超過 25 億年前形成的史前巨石中找到。反之，金雲火山岩卻可於年歲較輕的岩石中找到(大約 5 萬 6 千年前)。

要找出火山管的位置通常不易，因此要發掘鑽石需要先進行空中勘測(以飛機從高處進行磁力探測)，再於之後在地面進行大範圍勘測與鑽探。石榴石是勘測金百利岩的其中一個標記(追蹤元素)。

開採與處理

要提取鑽石可用多種不同的開採方法。地下開採利用豎井及斜坡，貫通至地底深處蘊藏鑽石的金百利岩層。開採藏於地下深處的鑽石可透過梯段法及開鑿出隧道網絡進行。另一方面，接近地面的鑽石則可以露天開採法獲得。

淘沙採礦亦有被採用以開採沖積物。中國的大型鑽石礦場主要集中在山東及遼寧省，開採的是金百利岩沈澱物。

Mining

Diamonds are extracted by various mining methods. Underground mining targets in-situ diamonds at depth by driving vertical shafts and declines down to the level where diamond bearing Kimberlites exist. Rooms or stopes and a network of tunnels are used to mine the diamonds at depth. In contrast, open pit mining targets near surface diamonds.

Placer mining is also adopted to mine alluvial deposits.

In China large diamond mines are mainly located in Shandong and Liaoning Province, PRC. These mines are kimberlite deposits.

Top World Gem Quality Diamond Production

(Source: USGS)

	Countries 國家	2009 (k carat) (千卡)	2010 (k carat) (千卡)
1	Botswana 博茨瓦納	24,000	24,000
2	Russia 俄羅斯	17,800	18,000
3	Canada 加拿大	10,900	11,000
4	Angola 安哥拉	8,100	8,100
5	Congo 剛果	3,600	3,600
6	South Africa 南非	2,400	2,400
14	China 中國	100	100

市場

雖然鑽石吸引力非凡，但要維持銷量仍需靠大量的市場推廣和宣傳。純白色及無色的鑽石是最純潔並且最受歡迎的鑽石，當中以無色的鑽石最昂貴。鑽石上有顏色是代表鑽石中有雜質，而有顏色的

Market

Although diamonds are attractive, considerable marketing and promotional effort is still required to maintain sales. White and colourless diamonds are the most popular and the purest, colourless diamonds are the most expensive. Colour is derived from impurities and coloured varieties are referred to as fancy diamonds. Pink diamonds tend to be the most expensive of the coloured varieties, particularly those that approach a deeper pink or red colour. Price however is primarily dependent on uniqueness. For example red, purple and blue varieties can be extremely rare and are seldom available on the open market resulting in high prices. On the other hand, brown diamonds, which are commonly found at the Argyle Diamond Mine in NW Australia, do not hold the same appeal. Many years ago, this prompted the owner, the Rio Tinto group, to promote them as champagne and cognac toned. However, high volume sales for this colour variety have not been very successful.

Diamond Color 鑽石顏色	Causes 原因
Yellow / Orange 黃色 / 橙色	Nitrogen impurities 含氮雜質
Blue 藍色	Boron impurities 含硼雜質
Violet 深紫色	Hydrogen impurities 含氫雜質
Red / Pink / Purple / Cognac 紅色 / 粉紅色 / 淺紫色 / 干邑色	Compressed crystal structure of diamond 鑽石的壓縮結晶結構
Green 綠色	Natural radiation in the earth 泥土中的自然輻射

鑽石通常稱為彩鑽。在彩鑽當中，粉紅色一般來說是最貴的一種，特別是偏向深粉紅色或紅色的種類。縱使如此，價格高低主要還是要看鑽石是否獨特，例如紅鑽、紫鑽及藍鑽等極之罕有的種類，絕少在市場上有售，導致價格高昂。反之，啡鑽這種在澳洲西北部亞皆爾鑽石礦場有豐富存量的鑽石則沒有同樣的吸引力。因此，多年前礦場的擁有者力拓集團(Rio Tinto group)嘗試把啡鑽宣傳為帶有香檳及干邑色澤的鑽石，希望可帶動銷量，可惜並不非常成功。

The 4 Cs

Diamond quality is measured by the four Cs - carat, colour, clarity and cut.

Carat (ct) is a unit to measure the weight of diamond rather than gram or ounce and each carat is 0.2 gram.

Colour: A pure diamond is transparent and colourless. However, it is rare to find a pure diamond. Most contain impurities or structural defects. Diamond colours range through the light spectrum (i.e. the colours of a rainbow). For colourless diamond (white diamond), the grading ranges from D to Z:



Grading 級數	D - F	G - J	K - M	N - R	S - Z
Colour 顏色	Colourless 無色	Nearly colourless 近乎無色	Faintly tinted 微淡黃色	Lightly tinted 淡黃色	Tinted 淺黃色

Clarity of diamond is determined by whether there are any inclusions or blemishes.

鑽石的四個 C

鑽石的質素可靠 4C 來判別 - 卡 (carat) 色澤 (colour) 淨度 (clarity) 及 切工 (cut)。

卡 (ct) 是鑽石的重量單位，而非採用克或安士。每卡等如 0.2 克。

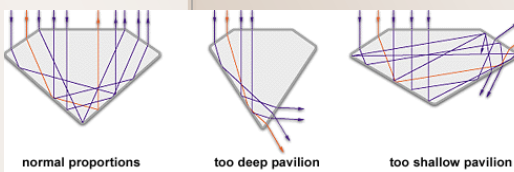
色澤: 一顆純淨的鑽石應該是透明和無色的。然而，純淨的鑽石十分罕有，大部分鑽石都含有雜質或存有結構性瑕疵。鑽石的顏色覆蓋整個光譜 (彩虹的顏色)。至於無色的鑽石 (白鑽)，則分為 D 至 Z 級:

淨度 取決於鑽石內是否有內含物或污點。

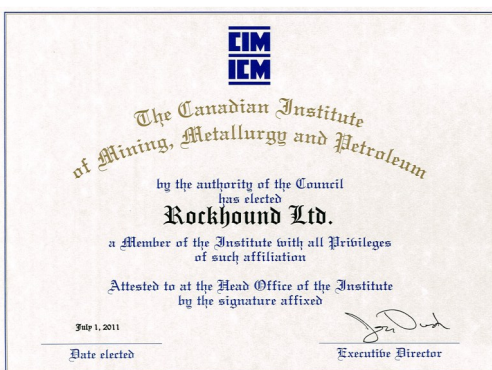
Clarity grade 淨度等級	Using a 10x magnification 在10倍放大鏡下
Flawless (FL) 無瑕疵	No flaws detected 完美無瑕
Internally flawless (IF) 內無瑕疵	Only blemishes visible 內部完美無瑕，表面稍有瑕疵
Very very slightly included (VVS ₁ , VVS ₂) 極輕微瑕疵	Minute inclusions, difficult to be seen 含極微量內含物，肉眼難察
Very slightly included (VS ₁ , VS ₂) 輕微瑕疵	Inclusions not easily visible 含極小瑕疵，不易看到
Slightly included (SI ₁ , SI ₂) 微瑕疵	Inclusions noticeable 含小瑕疵，容易看到
Included (I ₁ , I ₂ , I ₃) 有瑕疵	Obvious inclusions may affect appearance 肉眼可見的瑕疵



Cut refers to how correctly the diamond shape is cut, although people often mix it up with the shape of the diamond. The choice of diamond shape is often constrained by the nature and internal crystal structure of the rough stone. For example, the designer follows the cleavage (plane of weakness in crystal structure) or fractures to reduce the workload and to avoid having flaws in the final diamond. The cut is very important and influences the beauty of diamonds. Traditionally, a round brilliant diamond has 58 facets. Present technology has been improved and the use of computer modeling can optimize the cutting and polishing of diamond to create sparkle. A nicely cut round diamond can now have over 80 facets and may consist of a distinctive pattern. One of the more recent popular cuts reveals a visual pattern of eight hearts and eight arrows.



切工 指鑽石形狀的切割技巧是否得宜，而非很多人經常誤以為與鑽石的切割形狀有關。鑽石的切割形狀取決於毛鑽石的天然狀態及內部結晶構造。例如，設計師可以沿著鑽石的解理 (晶體的斷面) 或裂縫進行切割以節省工夫及減低最後鑽石成品出現瑕疵的機會。切工對於鑽石的美感影響非常大。傳統上，一顆經琢磨的圓形多面形鑽石可有 58 面。現今科技的愈趨成熟，利用電腦造型技術，可優化鑽石的切割和琢磨造出閃爍璀璨的效果。一顆切割得宜的圓形鑽石已經可以有超過 80 面，形狀造型獨特。較近期的一款頗受歡迎的切割款式是八顆心和八支箭的圖案。



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Steinmetz Mulls Hong Kong IPO for Koidu Diamond Mine

石礦考慮在香港上市

23/1/2012 <IDEX Online News>

The Beny Steinmetz Group (BSG) is considering a public float of its Koidu diamond mine in Sierra Leone on the the Hong Kong stock exchange, according to a report by the Financial Times.

The Koidu mine is expected to produce half a million carats this year and the BSG hopes to raise between \$400 million and \$600 million with its initial public offering and achieve a valuation of between \$2 billion and \$3 billion.

The BSG's Steinmetz Diamond Group is one of the De Beers Diamond Trading Company's (DTC) largest Sightholders. However, the diamond processing group's assets will not be paired with those of the Koidu mine in the public offering. Instead, the BSG has created a new holding company called Octea for the mine and the public offering will be for Octea only.

Octea's long-term plan is to increase Sierra Leone rough diamond production to 2.5 million carats annually.

Graff Diamonds Hires Major Banks to Handle Hong Kong IPO

倫敦鑽石零售商準備於香港上市

14/12/2011 <Antwerp World Diamond Centre>

London-based diamond retailer Graff Diamonds has hired Credit Suisse, Deutsche Bank, Goldman Sachs and Morgan Stanley to deal with an expected initial public offering (IPO) in Hong Kong.

Founded by jeweller Laurence Graff, the company is reportedly aiming to raise around \$1 billion from the listing, which is expected in the first half of 2012.

Chinese giant Chow Tai Fook Jewellery last week raised \$2 billion from a Hong Kong IPO despite unstable markets and strong competition for investors. The largest jewellery retailer in Hong Kong and China, the company will start trading on December 15, FinanceAsia reported.

Graff's reported aim of listing in Hong Kong is part of a recent trend where international brands are listing close to their rapidly growing consumer base in Asia.

Graff is aiming to open two new flagship stores in Macau and Hangzhou in China next year, which will join stores already open in Tokyo, Hong Kong, Shanghai, Beijing and Taipei.

It is estimated that jewellery sales in China will grow at a compound annual growth rate of 25 percent in the coming years.

中國一半鑽石埋在大連 百萬克拉金剛石礦被發現

Huge Diamond Mine Found in Liaoning 13/1/2012 <大連晚報>

(繼2010年省地礦部門在我市瓦房店地區發現藏有21萬克拉(約等於42

公斤)的金剛石礦後,不久前,又傳來一條振奮人心的消息:瓦房店地區又一座埋藏地下4億多年的“珍寶庫”——預計礦藏量約100萬克拉(約合200公斤)的金剛石礦被發掘出來。

遼寧省第六地質大隊前總工程師郭陽春介紹,這是遼寧近30年來發現最大的金剛石礦,礦藏量預計可開採30年以上,但出于多方面綜合因素考慮,目前該礦藏暫時不能進行開採。

金剛石礦有著珍寶庫的美稱,瓦房店素有鑽石之鄉的美譽:早在20余年前,瓦房店地區的“50號岩管”就已發現並成功開採出了鑽石;2010年,地礦部門又在瓦房店地區發現一處21萬克拉的金剛石礦。

據郭陽春介紹,這次新發現的百萬克拉礦藏是距2010年發現礦藏不到50公裏的“30號岩管”的隱伏礦體,在這裏的地下深達860米處,地礦人員發現了厚度達130米的金伯利岩層。

來自省地礦勘查局的信息顯示,瓦房店地區的金剛石比南非的金剛石礦純度還要好,寶石級別以上的金剛石達到70%左右(澳大利亞的金剛石儲量雖然居世界第一,但品位低,寶石級的只佔5%),而此次發現的新礦寶石純度將很高。

新發現的金剛石礦具體價值如何,專家表示暫時還無法估算。

按照目前的開採速度,全世界的鑽石儲量,預計在20多年後消耗殆盡。

目前中國成規模的金剛石礦主要分布在遼寧瓦房店和山東臨沂等地,其中瓦房店地區的金剛石礦藏量排名中國首位,約佔全國總量的54%。專家告訴記者,雖然瓦房店地下金剛石礦藏價值巨大,但由于多方面因素限制,這些礦藏暫時無法全部開採。

最富的50號岩管上世紀70年代中期就發現了,直到1987年開始論證,1990年才開始正規的露天開採,前後經歷了十幾年。

而這次新發現的隱伏礦體目前還處於勘測階段,究竟何時開採仍是未知數。

Stornoway Filed NI 43-101 Technical Report

Stornoway 申報 NI43-101 的技術報告

4/1/2012

Stornoway Diamond Corporation (TSX: T.SWY) announced the filing of a NI 43-101 technical report representing the qualifying Feasibility Study for the Renard Diamond Project in Quebec, Canada.

Rockhound is a HK based company set up to serve the minerals industry in the Region. The company offers technical valuations and services in the natural resources sector.

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