



# ROCKHOUND NEWSLETTER

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### Coal

For many hundreds of years coal has been used as a fuel. Large-scale use started in the 18<sup>th</sup> century when the coal powered steam engines of the Industrial Revolution replaced the water wheel. Coal is generally classified as follows:

### 煤炭

數千年來，煤炭一直被用作燃料。十八世紀，工業革命期間發明的燃煤推動蒸汽機取代了水車，煤炭因而開始廣泛使用。一般來說，煤炭的分類如下：

Class or Ranking 種類或等級	Group 組別	Fixed Carbon (wt % dry mmf) 固定碳 無礦物乾基 重量百分比	Volatile Matter (wt % dry mmf) 揮發物 無礦物乾基 重量百分比	Gross Heating Value (kcal/kg moist mmf) 總熱值 無礦物濕基 千卡/公斤
Anthracitic 無煙煤	Meta-anthracite (高煤化無煙煤)	> 98	< 2	>7,800
	Anthracite (無煙煤)	92 - 98	2 - 8	
	Semi-anthracite (半無煙煤)	86 - 92	8 - 14	
Bituminous 煙煤	Low-volatile bituminous (低度揮發煙煤)	78 - 86	14 - 22	>7,800
	Medium-volatile bituminous (中度揮發煙煤)	69 - 78	22 - 31	>7,800
	High-volatile A bituminous (高度揮發A級煙煤)	< 69	> 31	> 7800
	High-volatile B bituminous (高度揮發B級煙煤)	As Above (同上)	As Above (同上)	7200 - 7800
	High-volatile C bituminous (高度揮發C級煙煤)	As Above (同上)	As Above (同上)	6400 - 7200
Subbituminous 次煙煤	Subbituminous A (A級次煙煤)	As Above (同上)	As Above (同上)	5800 - 6400
	Subbituminous B (B級次煙煤)			5300 - 5800
	Subbituminous C (C級次煙煤)			4600 - 5300
Lignite 褐煤	Lignite A (黑褐煤)	As Above (同上)	As Above (同上)	3500 - 4600
	Lignite B (棕褐煤)			< 3500

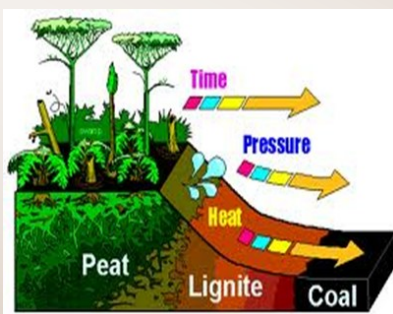
Source: ASTM Ranking System

(mmf: mineral matter free)

**Coal formation:** Coal forms from vegetation. When a plant dies, it will decay. Over geological time, the buried plant will be subjected to high pressures and temperatures, which will vary according to burial depth and geological events. With time, the vegetation will be transformed into peat and then into coal.

Coal quality is controlled by:

- Type of vegetation
- Burial depths, temperature and pressure
- Length of time that the vegetation is buried



**煤炭的形成：**煤炭由植物而成。植物枯萎後，便會腐爛。經過長年累月，埋藏地下的植物會受到高壓及高溫影響，但所承受的壓力及溫度會因埋藏深度不同而改變。地下的植物會隨着時間轉化為泥煤，再變成煤炭。

煤的質素取決於：

- 植物的種類
- 埋藏的深度、溫度及壓力
- 植物埋藏的時間



Typical example of a peat bog on a Scottish mountain.

位於蘇格蘭山上泥炭沼澤

Coal "ranking" is directly proportional to carbon content and heat value and indirectly proportional to sulfur, moisture and volatile content. The higher the rank, the better the quality. Higher rank coal is typically hardened by high burial pressures and has a darker color and is called **hard coal** or **black coal**. Low rank coal is called **brown coal** or lignite and these are often shallow geologically younger coals that are of lower economic value. Commercially, coal is marketed primarily based on its heat value while taking into account ash content, sulfur, moisture and volatiles. After coal is burned in power stations the ash by-product can be processed and blended with cement for construction purposes.

煤炭的「等級」與碳含量及熱值成正比，但與硫、水分及揮發含量成反比。愈高級的煤，品質愈好(主要取決於埋藏的時間及深度)。較高級的煤，一般是因高度埋藏壓力而變硬，而且色澤較深，稱為**硬煤**或**黑煤**，而低級的褐煤則稱為**棕煤**。從商業角度而言，煤主要按其熱值-出售，但仍會考慮其煤灰含量，以及存有的硫、水分及揮發物。煤在發電站燃燒後，其副產品煤灰可經處理，然後與水泥混合，作建築用途。

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Different coal types have different physical and chemical properties and different end uses. The diagram below summarizes the use of each type of coal.

不同種類的煤有不同物理及化學特性，以及不同的最終用途。下圖概述了每種煤的用途。

The terms **Thermal coal** and **Coking coal** are commonly used. Both these coals have a similar geological origin. Thermal coal ("steam coal") is the world's most abundant fossil fuel: it is higher in moisture content and lower in carbon content and burned for steam to run turbines to generate electricity in power plants. Coking coal ("metallurgical coal") is higher in carbon content and is mostly used in the metallurgical processes to supply heat and carbon (to be a reducing agent for iron ore processing). The price of coking coal is largely dependent on steel demand.

**Mining Method**

Shallow coal seams are extracted by surface mining: the overburden is first removed and then the coal seam is systematically mined in strips. Deep coal seams are extracted using underground mining methods such as the **Room and Pillar** or the **Longwall** methods. In the former the deposit is mined by a network of rooms leaving pillars of coal to support the roof: this means that the total percentage recovery is reduced significantly. In Longwall mining, the deposit is mined section by section with the roof temporarily held by artificial supports. In this instance the recovery rate can reach over 75%. Surface mining has a much lower cost than underground mining.

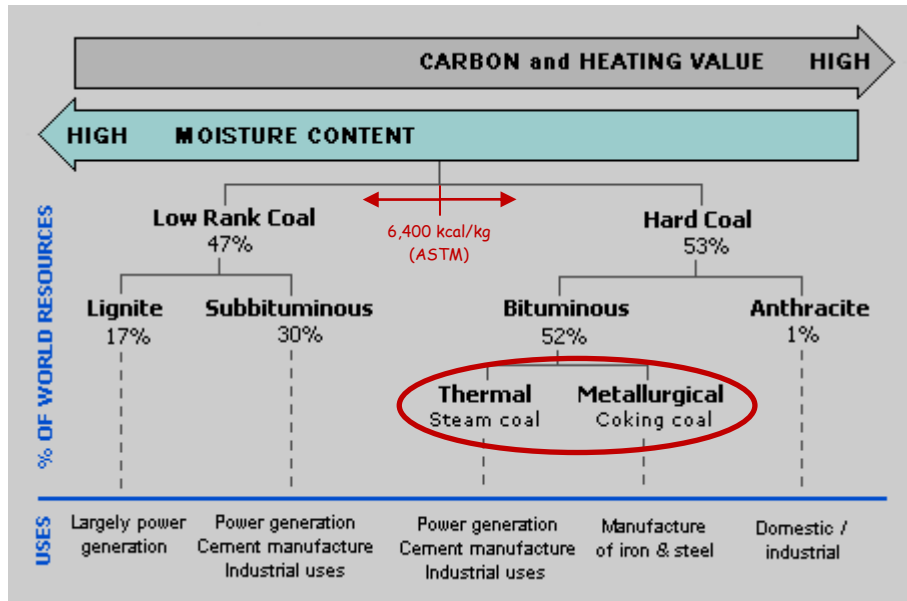
**Transportation and processing**

Another major issue which affects coal production cost is transportation. Mined coal is typically transported by conveyor or truck over short distances and by trains, barges and ships over long distances. Coal can also be mixed with water and transported by pipeline as coal slurry. The type of transport will also be dictated by the quality of coal and the economics of the transport cost. For example, lignite will not be sold internationally because it is of low quality while high quality (rank) coals, such as those from Queensland and supplied extensively to China and transported to international markets by ship. To make it more cost effective, higher rank coal is also processed to meet specification set by end users. **Coal washing** is adopted to remove impurities and harmful elements. Raw coal is first crushed to specific size then separated using the difference in relative densities. Water used in this washing process is often referred as **Blackwater**, and contains hazardous substances and has to be treated properly to avoid environmental problems.

**Environmental Issues**

Coal mining raises environmental concerns which are common to all mining activities, such as soil erosion, dust, noise and water pollution. Old coal mines may cause land subsidence and many documented examples exist in Europe from mines worked during the Industrial Revolution. These issues can be mitigated with a proper mining plan.

Probably the greatest environmental concern associated with coal mining is the release of greenhouse gas, namely methane which causes global warming and acid rain. The burning of coal also produces particulates and other greenhouse gases such as oxides of carbon, sulfur and nitrogen. In the 1950s London was famous for its smog, the result of the burning of coal to produce heat for households.



Source: World Coal Association ([www.worldcoal.org](http://www.worldcoal.org))

熱煤和焦煤這兩個詞語經常普遍使用。這兩種煤亦有相似的來源。熱煤(「動力煤」)是世界上藏量最豐富的化石燃料：其水分含量較高、碳含量較低，會在發電廠燃燒產生蒸氣，用來推動渦輪發電。焦煤(「冶金煤」)的碳含量較高，多數用於冶金過程，

以便提供熱能和碳(鐵礦處理的還原劑)。焦煤的價錢大大取決於對鋼鐵的需求。

**採礦方法**

淺層煤會以露天開採法開採：首先移除表土，再有系統地逐條開採煤層。深層煤則以地下開採法開採，例如房柱或長壁開採法。房柱開採法會以房間網絡開採礦床，留下煤柱支撐礦頂，這意味着總回收率會大為降低。長壁開採法會以人造支柱臨時支撐礦頂，再逐節開採礦床。在這種情況下，修復率可達 75% 以上。雖然露天開採的成本較地下開採為低，但一般淺層的煤所埋時間較短，亦即是說其等級和經濟價值通常較低。

**運輸及處理**

運輸是影響產煤成本的另一個重要因素。開採出來的煤通常會以運輸帶或貨車作短途運輸，或以火車、躉船及輪船作長途運輸。煤又可與水混合成煤泥，再以管道運輸。不過，運輸的模式亦會取決於煤的質素及運輸時的經濟成本。例如褐煤不會於國際出售，但高質素(等級)的煤，好像來自昆士蘭的煤，則會由輪船運送至世界各地的市場。高級的煤會經過處理，以提高運輸效率。洗煤可去除雜質及有害物質。原煤會先破碎至特定的大小，再以相對密度的差異把水和煤分開。用在這種清洗過程的水一般稱為黑水，但當中含有有害物質，須進行適當的處理，以免造成環境問題。

**環境問題**

採煤引起的環境問題，例如水土流失、塵埃、噪音及水質污染，亦常見於其他採礦活動。以前的煤礦或會導致地面沉降，並有很多事例證明。適當的採礦計劃可減少這些問題。與採煤有關最嚴重的環境問題，或許是釋放出溫室氣體，亦即是會導致全球暖化及酸雨的甲烷。燒煤亦會產生微粒及溫室氣體，例如碳氧化物、硫氧化物及氮氧化物。五十年代，倫敦家庭燒煤取暖，因而出現的煙霧亦廣受關注。



Clean coal technologies have been developed to tackle environmental challenges by increasing efficiency and reducing emissions.

### Methane extraction

Methane is a gas formed as part of the process of coal formation. Methane, as a greenhouse gas, is not only 23 times more harmful than carbon dioxide, it is also highly combustible. Methane extracted from untouched coal seams is referred to as **Coal Bed Methane (CBM)**. Methane from working mines is referred to as **Coal Mine Methane (CMM)**, and from abandoned mines as **abandoned mine methane (AMM)**. To ensure mine safety and reduce greenhouse gas emission, methane is often extracted from the mine and fed into gas pipelines to be utilized as a supply of natural gas.

Currently, PetroChina Company Limited, China Petroleum & Chemical Corporation, CNOOC Limited and Enviro Energy International Holdings Ltd are the four HK listed companies which hold the licenses to extract methane in China. Canada has one of the most advanced methane extraction technologies.

### Coal to Liquids and Gasification

Coal liquefaction is a process that converts **Coal to Liquid Fuel (CTL)**. Liquid fuel can be used as a substitute for petroleum/diesel. These fuels are sulfur-free, low in particulates and nitrogen oxides, and can be used by the automotive industry and for domestic purposes. As coal is widely deposited compared to oil and gas, CTL is suitable for countries that rely on oil imports and have domestic reserves. South Africa has adopted the technology since 1955, and has the only commercial CTL operation today.

**Underground Coal Gasification (UCG)** allows better use of coal reserves by converting unworked coal - coal still in the ground - into a combustible gas which can be used for industrial heating, power generation or the manufacture of hydrogen, synthetic natural gas or diesel fuel. The basic UCG process involves drilling two wells into the coal, one for injection of the oxidants and another well some distance away to bring the product gas to the surface.

### Carbon Capture and Storage and Carbon Capture and Recycling

Modern coal technology applications allow more efficient use of coal and reduce the emission of methane and sulfur. However, the burning of coal will always produce carbon dioxide. **Carbon Capture and Storage (CCS)** and **Carbon Capture and Recycling (CCR)** are two solutions that help address this issue. CCS injects the carbon dioxide to be stored into deep geological formations while CCR recycles carbon dioxide by passing it through plants to create new energy by means of photosynthesis. None the less, to reduce particulates released into the atmosphere, various precipitators, filters, and scrubbers are used in a commercial combustion system.

### Facts:

- Today, coal generates about 40% of the world's electricity.
- Coal is mined on all almost all continents except Antarctica.
- Coal is a fossil fuel and is far more plentiful than oil or gas.
- At current rates of coal production about 119 years of coal supply remains worldwide. In contrast, proven oil and gas reserves are equivalent to around 46 and 63 years at current production levels.

### References:

World Coal Organization ([www.worldcoal.org](http://www.worldcoal.org))  
 Australian Coal Association ([www.australiancoal.com.au](http://www.australiancoal.com.au))

各國一直致力發展潔淨燃煤技術，透過增加效率、善用煤炭及減少排放，應付環境影響。

### 抽取甲烷

甲烷是在煤的形成過程中產生的氣體。甲烷是溫室氣體，其毒性不但較二氧化碳高 23 倍，而且是高度易燃的。從未開發的煤層抽取的甲烷為**煤層甲烷(CBM)**；從正在挖掘的礦井所取的是**煤礦甲烷(CMM)**；而從廢礦所得的為**廢礦甲烷(AMM)**。為確保礦井安全，並減少溫室氣體排放，甲烷通常從礦井中抽取，並送進輸氣管，用來供應天然氣。

現時，中國石油天然氣股份有限公司、中國石油化工股份有限公司、中國海洋石油有限公司，以及環能國際控股有限公司為四家在本港上市的公司，並有在中國抽取甲烷的牌照。加拿大的甲烷抽取技術是最先進之一。

### 把煤轉化為液體及氣化

煤液化是將**煤轉化為液體燃料(CTL)**的過程。液體燃料可作石油或柴油的代用品。這些燃料都不含硫、釋放較少的微粒及氮氧化物，並可在汽車工業或家庭使用。相比起石油及天然氣，煤的藏量較多，因此 CTL 適用於依靠石油進口及擁有煤炭儲量的國家。自 1955 年起，南非已採用有關技術，是現今唯一有商業 CTL 活動的國家。

氣化是把煤轉化為**合成氣**(一氧化碳及氫氣的混合物)的過程。合成氣其後會冷凝成為液體燃料。氣化同時可以用來「開採」不可採的煤，而**地下煤氣化(UCG)**則協助我們更好地利用本身的煤儲量。

### 碳捕集及儲存和碳捕集及循環再用

現代的煤炭技術應用更能有效運用煤，並減少甲烷及硫的釋放。不過，燒煤總會產生二氧化碳。**碳捕集及儲存(CCS)**和**碳捕集及循環再用(CCR)**是協助解決問題的兩個辦法。CCS把二氧化碳注入地下深處儲存，而CCR則通過植物以光合作用產生新能源，把二氧化碳循環再用。儘管如此，商業用的燃燒系統會使用各種除塵器、過濾器及洗滌器，減少釋放出大氣的微粒。

### 資料:

- 現時，煤生產全球約 40% 的電力。
- 除了南極洲，差不多所有大洲都有採煤活動。
- 煤是化石燃料，藏量遠超石油及煤氣。
- 就現時的產煤速度而言，全球仍有約 119 年的煤炭供應。不過，按照現時的生產水平，探明的石油及煤氣儲量只能在未來約 46 年及 63 年提供能源。



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## 資源稅改革上報中央

19/7/2011 &lt;蘋果日報&gt;

### Reform of Resource Tax in the PRC

據內地傳媒報道，討論多時的擴大資源稅改革方案，已上報國務院，改革將由「從量計徵」改為「從價計徵」的方向，徵收範圍亦會由在石油及天然氣的基礎上，擴展到其他資源產品。

從價計徵即將稅收與資源市場價格掛鉤，而非從量計徵的與生產量掛鉤，方法可避免過度開採及通過調整稅收調節資源利用，相關改變早在內地「十二·五」規劃中已有提及。

## 澳洲將徵碳排放稅

### Australia Introducing Carbon Tax

為減少溫室氣體排放，澳洲計劃於 2012 年 7 月起向國內的礦產、能源、交通等行業的 500 家大型企業徵收碳排放稅。由於中國每年都從澳洲進口大量的鐵礦石和煤炭，此方案將推高此等商品的出口價，影響中國企業。

## China Plans to More Than Double Coal-Gas Output by 2015

Jul 15/7/2011 &lt;Bloomberg News&gt;

### 中國計劃增加煤層氣產量

China, the world's largest energy user, plans to more than double production of its coal-bed methane in five years by 2015 to cut reliance on oil and coal.

The country aims to increase its annual output to 21 billion cubic meters by 2015 from 8.6 billion cubic meters in 2010, China Petrochemical Corp., the nation's second-largest oil and gas producer, said in its online newsletter today, citing a five-year plan. The fuel, also known as coal-seam gas, is a form of natural gas trapped in coal beds.

## 原野礦產不要採玩殘「蒙股」

19/7/2011 &lt;蘋果日報&gt;

### Mongolia Enacted Mining Law Affecting HK List Co

按照《禁止採礦法》，礦企禁止在蒙古森林法界定的河流湖泊源頭和森林等區域，以及湖泊周邊區域，進行礦產勘探和開採，市場料逾 1500 個許可證受影響，大部份受影響許可證屬於 Selenge、Bulgan、Tuv 等地區。自該法律頒佈後，蒙古政府遲遲未清楚界定禁止採礦區域的邊界，僅承諾受影響的許可證持有人將獲得賠償，但賠償的具體方式仍未確定。本港上市公司中，原來除蒙古能源（276）外，南戈壁（1878）亦有部份勘探許可證恐受有關法律波及。

## 中裕燃氣控股有限公司

### Zhongyu Gas Holdings Limited (8070)

可能出售一間煤層氣附屬公司之部份權益

### Possible Sale of Partial Interest in a CBM Subsidiary

21/07/2011 — 該公司宣佈，正在就出售河南中裕合資公司約 4.4% 之股本權益與恒泰艾普磋商。恒泰艾普乃於中國成立之公司，其已發行股份在深圳證券交易所上市，且為獨立第三方。

中裕河南持有河南中裕合資公司之 90.9% 股本權益，河南中裕合資公司則持有焦作合資公司 95% 之股本權益。河南中裕合資公司之餘下 9.09% 股本權益及焦作合資公司之 5% 股本權益分別由河南煤層氣及焦作投資持有。中裕河南現為該公司之全資附屬公司。河南中裕合資公司與焦作合資公司之主要業務均為勘探及開發煤層氣。

## 全球最大未開發煤礦 神華夥美俄財團奪標

6/7/2011 &lt;蘋果日報&gt;

&lt;報&gt;

### China Shenhua Energy Company, US and Russia in Mongolia Coal Deal

中國神華（1088）、俄羅斯鐵路股份公司及美國博地能源（Peabody Energy）三家牽頭的財團，成功中標全球最大未開發焦煤礦——蒙古 Tavan Tolgoi 煤礦項目，當中神華佔項目 40% 股權。

Tavan Tolgoi 位於蒙古南戈壁地區，煤儲量約為 65 億噸，擁有全球最大的未開發焦煤礦，位於西部的 Tsankhi 儲量約 12 億噸，其中 68% 是焦煤，倘以年產量 1500 萬噸計算，預料可開採超過 30 年。

事實上，蒙古去年煤炭產量倍增至 2500 萬噸，令煤炭成為蒙古出口最主要產品，蒙古去年更佔中國進口煤炭三分之一，反映中蒙兩國在煤炭市場關係密切，相信隨着神華中標，中國在蒙古煤炭市場的影響力有望進一步擴大。

公司名稱	代碼	EPS (11E) (RMB)	EPS (12E) (RMB)	PE (11E)	PE (12E)
兗州煤業	1171	2.09	2.34	11.9	10.6
中國神華	1088	2.31	2.44	12.8	12.1
中煤能源	1898	0.69	0.77	12.3	11.1
恒鼎實業	1393	0.57	0.77	9.3	6.8
永輝焦煤	1733	0.29	0.39	8.8	6.5
首鋼資源	639	0.35	0.39	11.8	10.4

資料來源: 交銀國際 (數據截至 23/6/2011)

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