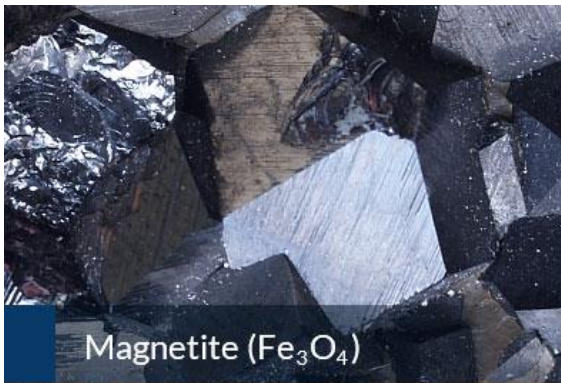
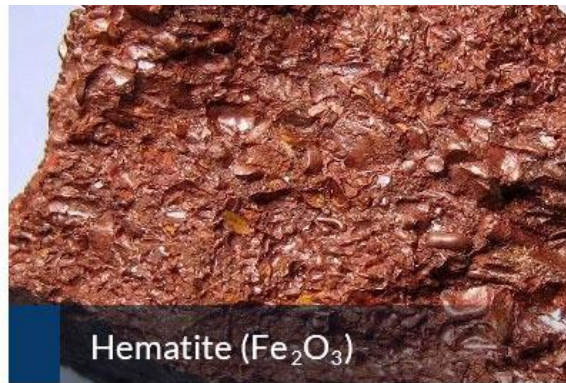




鐵礦 Iron ore



Magnetite (Fe_3O_4)



Hematite (Fe_2O_3)



Limonite ($2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$)



Siderite (FeCO_3)

Iron ores are rocks and minerals from which metallic iron can be economically extracted. The ores are usually rich in iron oxides and vary in color from dark grey, bright yellow, or deep purple to rusty red. The iron is usually found in the form of magnetite (Fe_3O_4 , 72.4% Fe), hematite (Fe_2O_3 , 69.9% Fe), goethite ($\text{FeO}(\text{OH})$, 62.9% Fe), limonite ($\text{FeO}(\text{OH}) \cdot n(\text{H}_2\text{O})$, 55% Fe) or siderite (FeCO_3 , 48.2% Fe).

Ores containing very high quantities of hematite or magnetite, typically greater than about 60% iron, are known as natural ore or direct shipping ore, and can be fed directly into iron-making blast furnaces. Iron ore is the raw material used to make pig iron, which is one of the main raw materials to make steel—98% of the mined iron ore is used to make steel.

In 2011 the Financial Times quoted Christopher LaFemina, mining analyst at Barclays Capital, saying that iron ore is "more integral to the global economy than any other commodity, except perhaps oil".

鐵礦系指含鐵礦物，鐵礦為鐵的原料，元素符號 Fe，鐵原子序數：26，可用於提煉單質生鐵、煉鋼（占 98%[1]）等諸多用途。常見鐵礦都為鐵氧化物，大多呈暗灰色、亮黃色、深紫色或鐵鏽色。鐵是世界上發現最早、利用最廣、用量最多的一種金屬，其消耗量約占金屬總消耗量的 95%。鐵礦石主要用於鋼鐵工業，冶煉含碳量不同的生鐵（含碳量一般在 2%以上）和鋼（含碳量一般在 2%以下）。



含有非常大量的赤鐵礦或磁鐵礦（通常大於約 60%鐵）的礦石被稱為天然礦石或直接運輸礦石，並且可以直接送入煉鐵高爐。

鐵礦石是用來製造生鐵的原料，生鐵是煉鋼的主要原料之一 - 開採的鐵礦石 98%用於煉鋼。[2] 2011 年，英國《金融時報》引述巴克萊資本(Barclays Capital)礦業分析師克里斯托弗·拉費米納(Christopher LaFemina)的話稱，鐵礦石「對全球經濟的重要性超過任何其他商品，或許除了石油」。

4 types of iron ore

(1) Magnetite - best quality iron ore

Magnetite, also called lodestone. It is a natural magnet, hence the name, giving it a distinguishing characteristic.

Magnetite is the best iron ore. It has the highest iron content (up to 72.4%) and the strongest magnetic power. It can be separated from gangue, producing a high-grade concentrate (above 70%) with very few impurities. Magnetite's greatest use is as a high-quality iron ore for steel manufacture. It can also be applied in paints, ceramics, and magnetic micro- and nanoparticles for various technologies.



- Formula of magnetite: Fe_3O_4
- Magnetite iron content: Up to 72.4%
- Magnetite color: Black
- Magnetite hardness: 5.5-6.5
- Magnetite luster: Metallic
- Features: The best iron ore, strongest magnetic ore

磁鐵礦(Magnetite)：是一種氧化鐵的礦石，主要成份為 Fe_3O_4 ，是 Fe_2O_3 和 FeO 的複合物，呈黑灰色，比重大約 5.15 左右，含 Fe 72.4%， O 27.6%，具有磁性。



(2) Hematite - the main ore of iron

Hematite is the main ore of iron (Fe) and the most important ore of iron in terms of the quantity used, but its iron content is slightly lower than that of magnetite.



- **Hematite formula:** Fe_2O_3
- **Iron content in hematite:** Slightly lower than magnetite (up to 70%)
- **Hematite color:** Red, light gray, black
- **Hematite crystal:** Trigonal system
- **Hematite hardness:** 5.5-6.5
- **Feature:** The most important iron ore

赤鐵礦(Hematite)：也是一種氧化鐵的礦石，主要成份為 Fe_2O_3 ，呈暗紅色，比重大約為 5.26，含 Fe70%，O 30%，這種礦石在自然界中經常形成巨大的礦床，從埋藏和開採量來說，它都是工業生產的主要礦石，是最主要的鐵礦石。

(3) Limonite - inferior iron ore

Most limonite exists in the form of $2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$. According to different crystal water content, limonite minerals can be divided into water hematite, needle hematite, limonite, and the like.

It has been used as low-quality iron ore for thousands of years due to its small deposit and large water content. Therefore, limonite needs to be briquetted before smelting. It is also the most important ochre and umber pigment.



- **Formula of limonite:** $\text{FeO}(\text{OH}) \cdot n(\text{H}_2\text{O})$
- **Iron content:** Up to 59.8%
- **Color:** Yellowish (tan, dark brown, black gray)
- **Limonite luster:** Earthy
- **Limonite hardness:** 4-5.5
- **Features :** Amorphous and variable iron oxide, large water content



褐鐵礦(Limonite)：褐鐵礦是含水氧化鐵礦石，是由其他礦石風化後生成的，多半是附存在其他鐵礦石之中，在自然界中分佈得最廣泛，但礦床埋藏量大的並不多見。

(4) Siderite - carbonate of iron with no magneticity

Siderite iron ore is a hard and dense carbonate of iron, containing no sulfur or phosphorus and is mixed with carbonates such as magnesium, manganese, and calcium. Siderite is roughly the equivalent of calcite but with iron replacing the calcium.



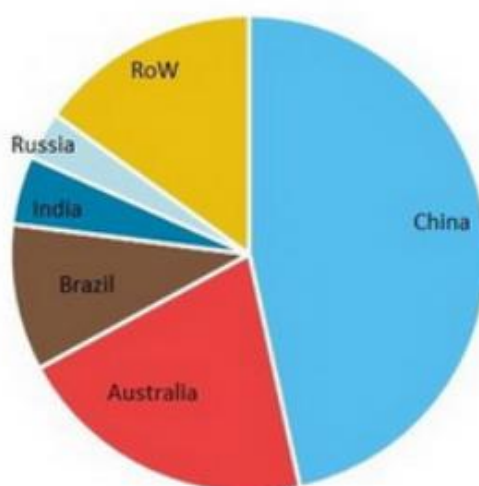
- Formula of siderite: FeCO_3
- Iron content: Up to 48.2%
- Siderite color: Gray, Yellow-brown
- Siderite hardness: 3.75-4.25
- Siderite luster: Vitreous, silky, pearly
- Features: Non-magnetic, easily weathered into limonite

菱鐵礦(Siderite)：是碳酸鹽鐵礦石，主要成份為 FeCO_3 ，呈現青灰色，比重在 3.8 左右。這種礦石多半含有相當多數量的鈣鹽和鎂鹽。在自然界中，有工業開採價值的菱鐵礦比其他三種礦石都少。菱鐵礦很容易被分解氧化成褐鐵礦。



Production of Iron Ore:

World Mine Production of Iron Ore



This is a list of countries by iron ore production based on U.S. Geological Survey data.

Rank	Country	Usable iron ore production (1000 tonnes)	Year
	World	2,500,000	2022
1	Australia	930,000	2019
2	Brazil	480,000	2019
3	China	350,000	2019
4	India	210,000	2019
5	Russia	99,000	2019
6	South Africa	77,000	2019
7	Ukraine	62,000	2019
8	Canada	54,000	2019
9	United States	48,000	2019
10	Kazakhstan	43,000	2019



鐵礦石的產地分布：

(1) 中國大陸境內

中國大陸鐵礦分佈主要集中在遼寧、四川、河北、北京、山西、內蒙古、山東、河南、湖北、雲南、安徽等、吉林、黑龍江、上海、江蘇、浙江、福建、江西、湖南、廣東、廣西、海南、貴州、西藏、陝西、甘肅、青海、寧夏和新疆等 29 個省、市、自治區。

中國鋼鐵工業協會宣佈，編製「中國鐵礦石價格指數」，規劃 2011 年 8 月試運行，10 月正式運行，按週發佈，中鋼協表示，編製此指數，目的是為了真實反映鐵礦砂行情。

(2) 國外市場

世界鐵礦資源集中在澳大利亞、巴西、俄羅斯、烏克蘭、哈薩克斯坦、印度、美國、加拿大、南非。巴西的淡水河谷(CVRD)，澳洲的力拓(RIO TINTO)和 BHP 是全世界前三大的鐵礦石大廠。

2019年估計鐵礦開

採量 (百萬噸) [3]

國家	產量
澳洲	930
巴西	480
中國	350
俄羅斯	210
南非	99
烏克蘭	77
世界總計	2123 ^[4]



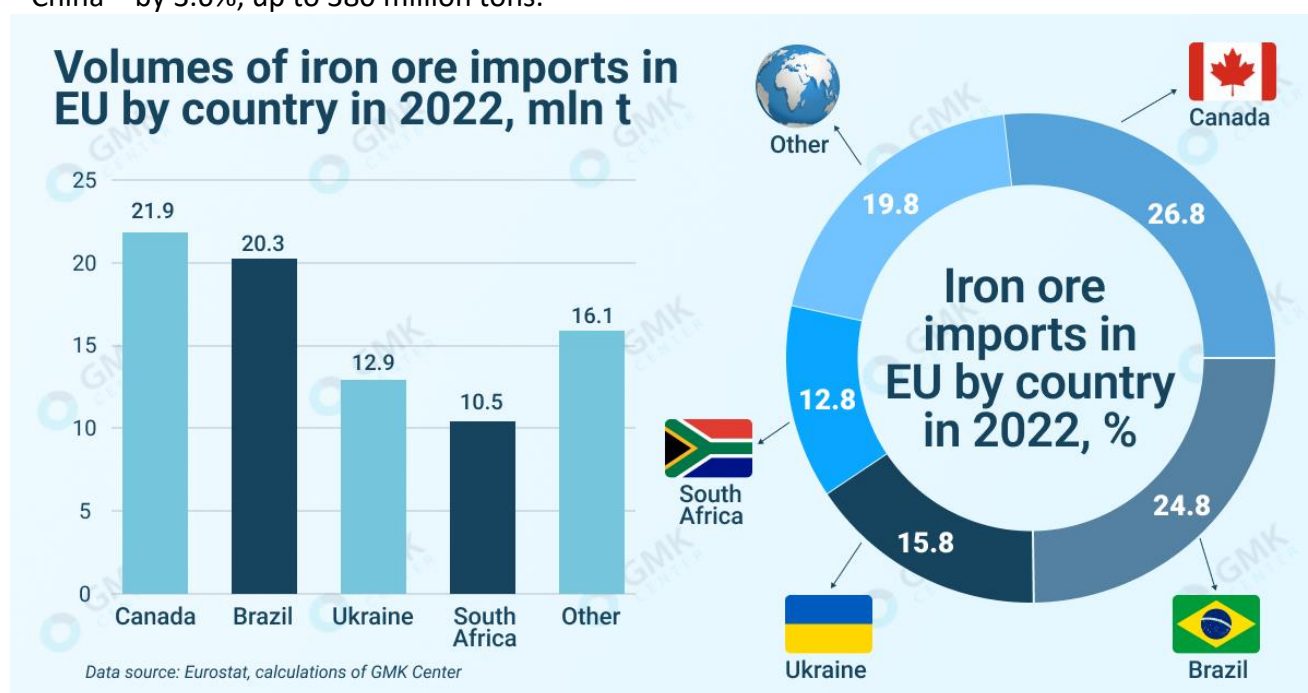
Global iron ore market trend: EU and Ukraine's prospects (July 2023)

In January-April, Ukrainian iron ore exports to the EU amounted to 19.7% of the total European imports. The global iron ore market is changing. China and India continue to increase their role and influence. Europe focuses more on imports of DR-grade iron ore products. Despite all the military risks and logistical difficulties, Ukraine remains an important supplier of iron ore. The EU countries have become the key market for Ukrainian exporters instead of China.

Global market

According to the US Geological Survey (USGS), global production of iron ore in 2022 decreased by about 3% and amounted to 2.6 billion tons. All three of the leading countries in the production of iron ore showed a decrease:

- Australia – by 3.5%, to 880 million tons;
- Brazil – by 4.8%, to 410 million tons;
- China – by 3.6%, up to 380 million tons.



鐵礦石的需求

鐵礦石總使用量最高的國家，依產品分：

- (1) 顆粒礦：中國大陸、獨立國協、美國、中東、印度、墨西哥、加拿大、東歐、非洲其他國家、德國等。
- (2) 塊礦：中國大陸、印度、日本、韓國、巴西、南非、台灣、委內瑞拉、阿根廷、澳洲等。
- (3) 燒結/直接環原鐵粉礦：中國大陸、獨立國協、日本、印度、韓國、巴西、德國、法國、台灣、東歐等。