

General Introduction to Nickel

I .Physicochemical Properties and applications

1. Physicochemical Properties

Metal nickel has chemical symbol of Ni, atomic number of 28, its density is 8.902g/cm³, the melting point is 1453°C and boiling point is 27321453°C. Nickel is a metal close to silver white, at low temperature it is of outstanding strength and ductility; at ambient temperature its surface will form tight oxide film in humid air that prevents continuous oxidation, nickel also readily forms alloy with other metals.

2.Main Purposes

Nickel is an important industrial metal, and is extensively applied with iron and steel industry, mechanical industry, architecture and chemical industry. The specific purposes include: Firstly, it is used a metal material such as preparation of stainless steel, heat proof alloy steel and different alloys; secondly it is used for electric plating, a surface layer that is durable and corrosion resistant is covered on steel and other metal as base, the corrosion resistance is better than zinc plating; thirdly, nickel is used as catalyst in the hydrogenation process in petrochemical; fourthly nickel is used as chemical power source and is the raw material to prepare nickel-hydrogen battery and Ni-Cd battery; fifthly, nickel is used to produce dyestuff and pigment, ceramic and ferrite as new concept materials.

3.Classifications

Nickel can be divided into primary nickel and regenerated nickel by difference in production raw material, the raw material of primary nickel comes from nickel mine, and the raw material for regenerated nickel comes from nickel containing scrap. The primary nickel includes electrolysis nickel, ferronickel and nickel salt. Where the electrolysis nickel can be divided into five specifications i.e. Ni9999, Ni9996, Ni9990, Ni9950, Ni9920 per national code GB/T6516-2010; ferronickel is also called nickel containing pig iron and is the alloy of nickel and iron, and is produced by nickel laterite ore through pyrometallurgy and sintering, the nickel content in ferronickel is from 5% to 30%, and it is classified into high nickel pig iron, medium nickel pig iron and low nickel pig iron per nickel content.

II .International Nickel Market

1. Nickel Production

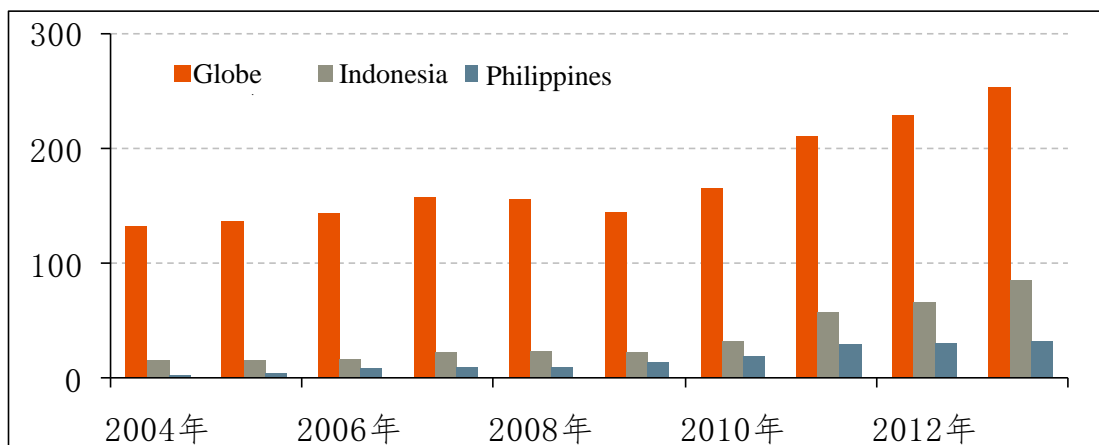
➤ Nickel Production

The nickel mineral resource is mostly divided into nickel sulfide ore and nickel oxide ore (which is also called laterite-nickel ore. In recent years, with the gradual decline of reserves for nickel sulfide ore globally, the ratio of laterite-nickel ore production is up to 70%.

The global nickel ore production (converted to nickel metal quantity) has grown from 1.31 MTA in 2004 to 2.53 MTA in 2013. Where Indonesia and Philippines with rich production of

laterite-nickel ore are the top two producers globally, the production in 2013 was 850 KTA and 310 KTA.

Chart 1: Global nickel ore production from 2004 to 2013

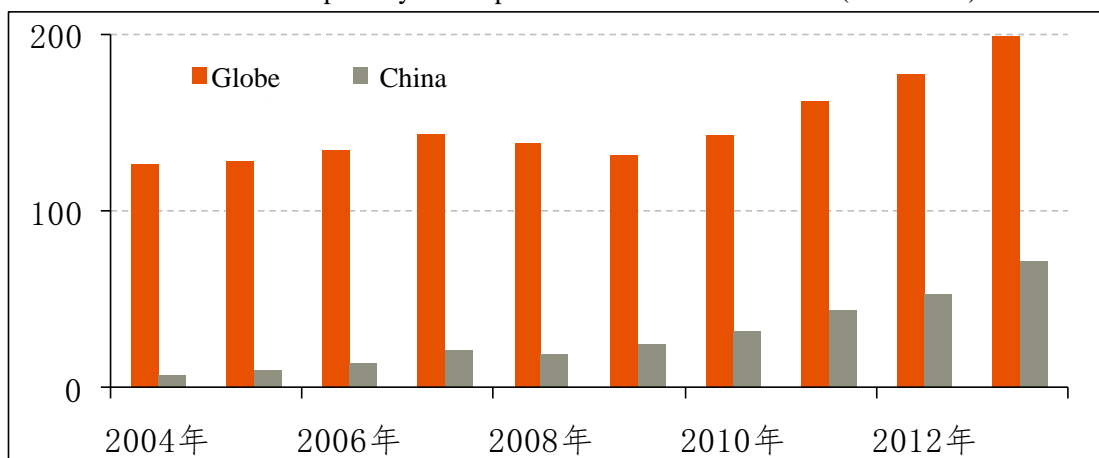


Source: CRU

➤ Production of Primary Nickel

The global primary nickel production (as converted to nickel metal quantity) has grown from 1.26 MTA in 2004 to 1.98 MTA steadily. Where China is the largest primary nickel producer, and the production of primary nickel in Russia, Japan, Canada and Australia is No. 2 to 5 in the world.

Chart 2: Global primary nickel production from 2004 to 2013 (in 10 KTA)

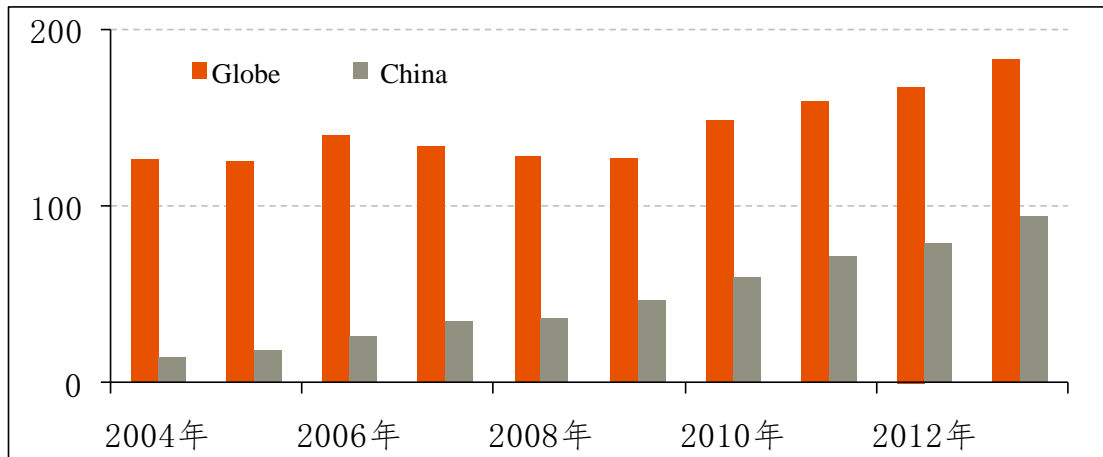


Source: CRU

2.Nickel consumption

According to the statistics from CRU, The global primary nickel consumption grew from 1.27 MTA in 2004 to 1.83 MTA in 2013. Where China is the larger consumer for primary nickel globally, whose consumption in 2013 accounted for more than 50% of the global total, the primary nickel consumption in the US, Japan, Korea and Germany were No. 2 to 5.

Chart 3: Global primary nickel consumption from 2004 to 2013 (10 KTA)



Source: CRU

3.Nickel Trade

According to the statistics by GTIS (Global Trade Information Service), the refined nickel export as reported globally in 2013 was roughly 800 KTA, and Russia, Canada, Holland, Norway and Singapore were the main exporters; the refined nickel imports as reported globally were about 870 KTA, China, Holland, the US, Malaysia, Germany and Singapore were the main importers. Although Holland, Malaysia and Singapore are not main producers and consumers of refined nickel, LME had set up delivery warehouses in those three nations, Holland, Malaysia and Singapore thus became the globally important refined nickel logistics and distribution centers.

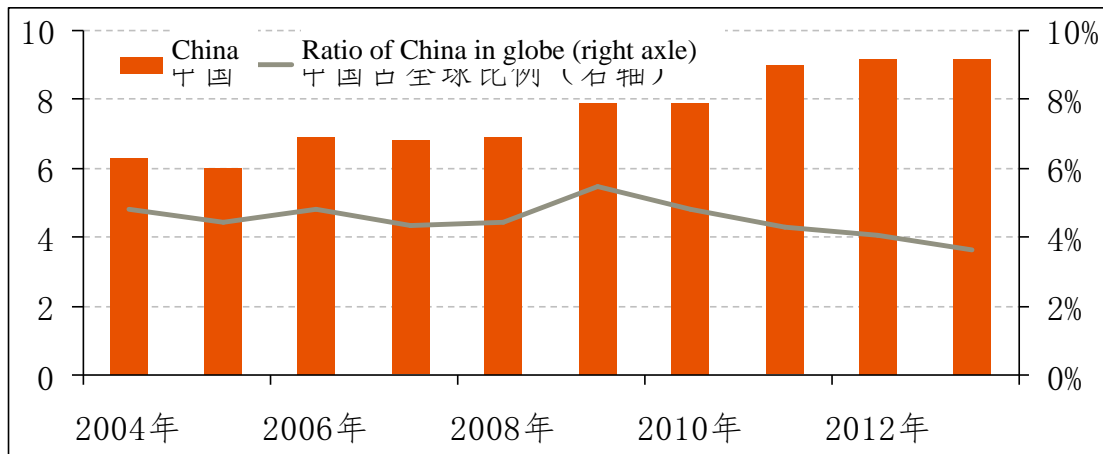
III.Domestic Nickel Market

1.Nickel Production

➤ Nickel Ore Production

China nickel ore resource is limited, and the international dependence of nickel ore resource is high. In 2013 China nickel ore production (as converted to nickel metal quantity) was roughly 92 KTA, where the share of Gansu province was 80%, and the share of Gansu, Jilin and Xinjiang exceeded 90%.

Chart 4: China nickel ore production (in 10 KTA) from 2004 to 2013

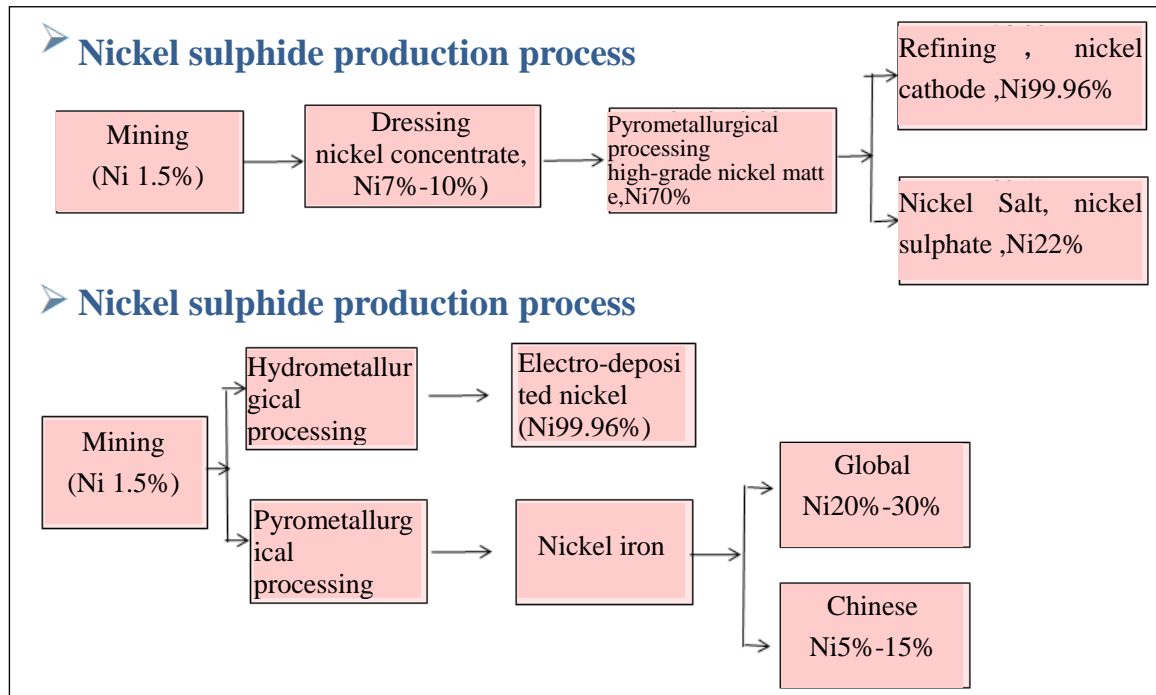


Source: CRU

➤ Production Process

The production process of nickel is complicated because of the low-grade nickel ores with complex compositions and inter-grown minerals. Based on the classification, grade and customer requirements, a nickel production process may produce a number of different products, e.g. pure products like nickel squares, pellets and rounds, and non-pure products like nickel oxide sinters and nickel-iron, etc. Chart 4 shows the production process of nickel products.

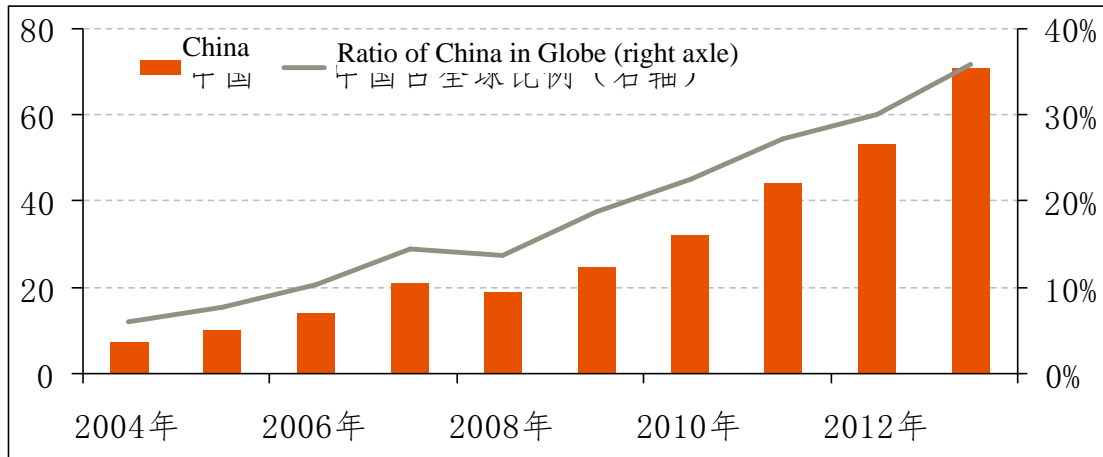
Chart 5: Nickel Production Process



➤ Nickel Production

According to the statistics from the CRU, China primary nickel production (as converted to nickel metal quantity) grew from 76 KTA in 2004 to 710 KTA in 2013, the world share rose from 6% to 36%. Where the electrolysis nickel production was up from 76 KTA in 2004 to 27.8 KTA in 2013, ferronickel production (as converted to nickel metal quantity) was only 3 KTA in 2005 and exceeded 400 KTA in 2013.

Chart 6: China Primary Nickel Production (in 10 KTA) from 2004 to 2013

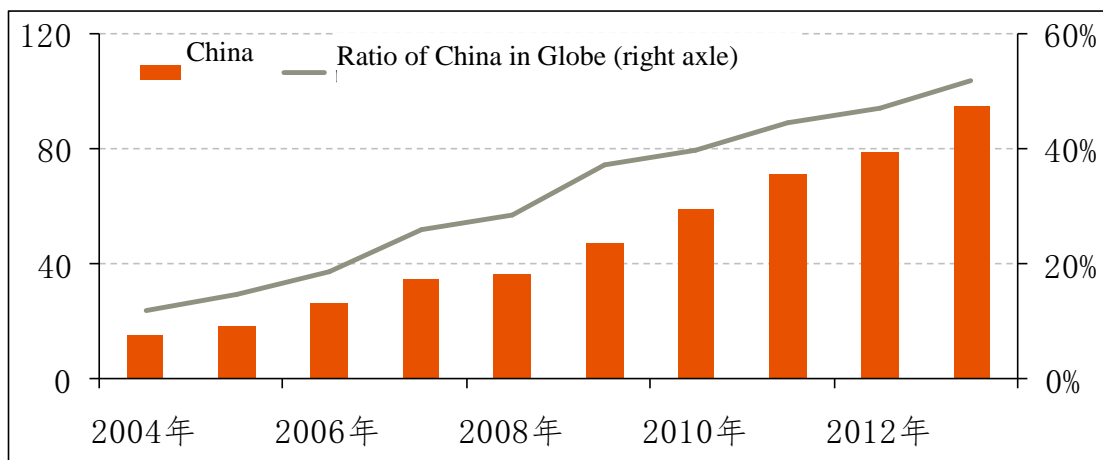


Source: CRU

2. Nickel Consumption

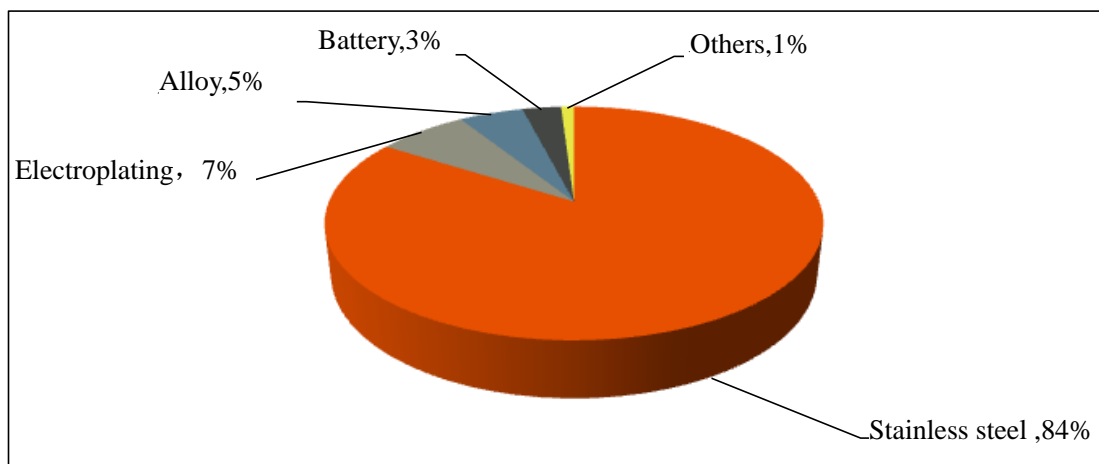
According to the statistics from the CRU, China consumption of primary nickel was up from 150 KTA in 2004 to 950 KTA in 2013, the share in world total consumption rose from 12% in 2003 to 52% in 2013. Stainless steel is the major downstream consumption sector for nickel. Over 60% global nickel demand is from the stainless steelmakers. In China, over 84% nickel demand is from domestic stainless steelmakers. Among other, 300 series stainless steel accounts for about 50% of total Chinese stainless steel output.

Chart 7: 2004-2013 Chinese Primary Nickel Consumption (in 10 KTA)



Source: CRU

Chart 8: Nickel consumption ratio by industry in China 2014

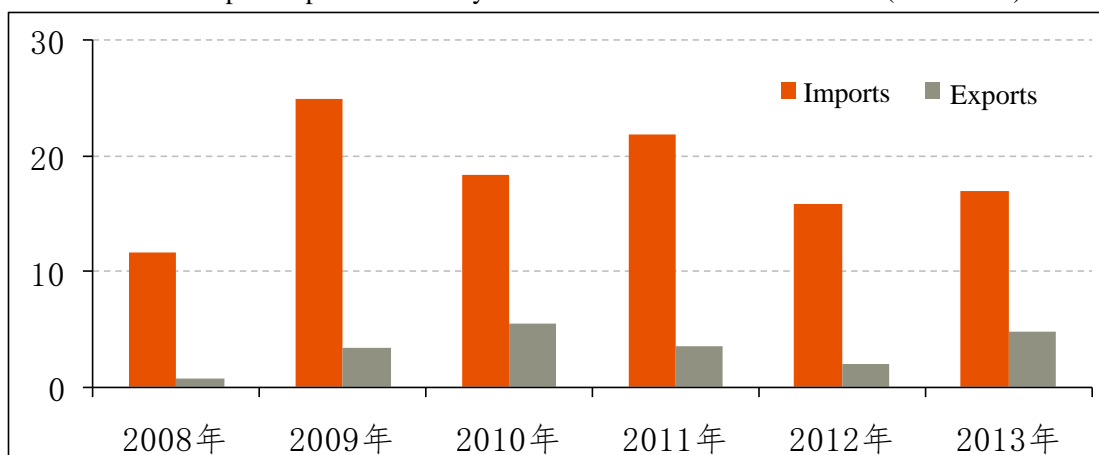


Source: Antaika

3.Nickel Imports/Exports

In recent years, Chinese import of nickel cathode has been maintained at a high level. The major suppliers include Russia, Canada and Norway. Since 2012, due to the significant increase of domestic nickel iron output, the demand of Chinese stainless steelmakers, the major consumer of nickel, has been falling. The key destinations of Chinese nickel export include South Korea, Singapore and Malaysia.

Chart 9: Import/export of electrolysis nickel in China in 2008 to 2013 (in 10 KTA)



Source: General Administration of Customs

IV.Key Factors Impacting Nickel Price

➤ Supply-demand Relation

According to micro-economic theories, the price of a commodity shall fall when it is over-supplied and rise when it is under-supplied. On the other hand, the demand of the commodity shall decrease when the supply grows along with the rising of price and increase when the supply falls along with the falling of price. This is the interaction between the price and the demand and supply of a commodity.

Stock is a very important indicator of the demand and supply relation. Nickel stock can be classified into two classes: reported stock and unreported stock. The reported stock is also referred to as Visible Stock or Exchange Stock. The unreported stock is also called as Invisible Stock, referring to the stocks belonging to the manufacturers, traders and end users in the world. Since no one reports his stocks on a regular basis, institutions usually base their study over the change of stocks on reported stocks.

➤ Global and domestic economic development

The nickel is one of the most important non-ferrous metals. The nickel consumption is closely related to the economic performance. When the economy of a country or a region is developing rapidly, the nickel consumption will increase, too. Similarly, a sluggish economy shall pull down the nickel consumption in a number of industries and cause great turbulence on nickel market. In a macro-economic analysis, two indicators are very important, i.e. economic growth rate, or the GDP growth rate, and industrial production growth.

➤ The performance of down-stream industries

The nickel is one of the key materials of stainless steel. As a result, the performance of stainless steel industry has an immediate impact on the nickel consumption. It is necessary to study the changes in the stainless steel industry to have a direct view about the changes in the nickel consumption. In addition, electroplating and alloy industries are another two important nickel consumers on the industrial chain. The observation on these two industries shall enable us to understand the nickel demand changes in a big picture.

➤ Import and Export Policy

Import and export policies, especially the duty policies, are a significant instrument with which a state balances its domestic demand and supply by regulating the import and export volumes of a commodity by way of adjusting the import and export costs of the commodity.

Nickel is an important strategic resource. China tilted its import and export policies to encourage nickel import and discourage nickel export. According to the 2014 Tariff Execution Plan of the Ministry of Finance, Chinese tariff on nickel ore and concentrated ore import is Zero and on nickel export is 15%. Since January 1st, 2014, the import tariff on nickel cathode has been increased to 1% from zero, with the 15% export tariff unchanged.

Indonesia is the largest nickel exporter in the world. Its nickel export accounts for 20% of the total nickel transaction of the world. In 2009, Indonesian Parliament passed a Coal and Minerals Act that forbids nickel ore export from January 12th 2014, in order to improve the added-value of its minerals products by forcing mining companies operating in the Indonesia to establish refining plants. When the Act took effect on January 12th, 2014, the Indonesia nickel laterite export was shut down, leading to a great turbulence on the global nickel market.

➤ Production cost

Production cost is the foundation of the price of a commodity. When the market price of nickel

stays at a level lower than the production cost for a long time, nickel mines and smelters shall voluntarily cut down production, which eventually shall change the supply and demand relation on the market.

Current production cost of a nickel smelter is made up of following factors: concentrated nickel ore price, fuel and power cost, labor cost, production cost and other expenses. The change of the concentrated nickel ore price is the utmost factor influencing the nickel production cost.