

# **General Introduction to Tin**

## **I .Physicochemical Properties and applications**

### **1.Physicochemical Properties**

The chemical symbol of tin is Sn, whose atomic number is 50, density 7.365 g/cm<sup>3</sup>(20°C), the melting point is 231.9°C and boiling point is 2270°C. Tin is a soft, extendible, a silver white metal with slight bluishness. The chemical property of tin is stable, it is readily extruded, stretchable, forged and cut, and is corrosion resistant, readily molten, of low friction coefficient.

### **2. Main Purposes**

As tin is of low melting point, outstanding ductility, ready formation of alloys with many other metals, non toxic, corrosion resistant and of aesthetic outline, it is widely applied in many industries including the electronics, foodstuff, automobile, pharmaceutical, textile, architecture and handicrafts manufacture. The purpose of tin is mostly focused in tin solder, tinsplate, tin chemical and float glass: Firstly it is used as tin solder in the electronic industry serving the purpose of mechanical connection, electrical connection and heat exchange; secondly it is used to produce tinsplating sheet such as the tinsplate as food and beverage packaging material; thirdly tin compound may be used as the porcelain glaze, the dye mordant for printing and dyeing the silk fabrics, and thermal stabilizer for plastic and bactericide and pesticide.

## **II .International Tin Market**

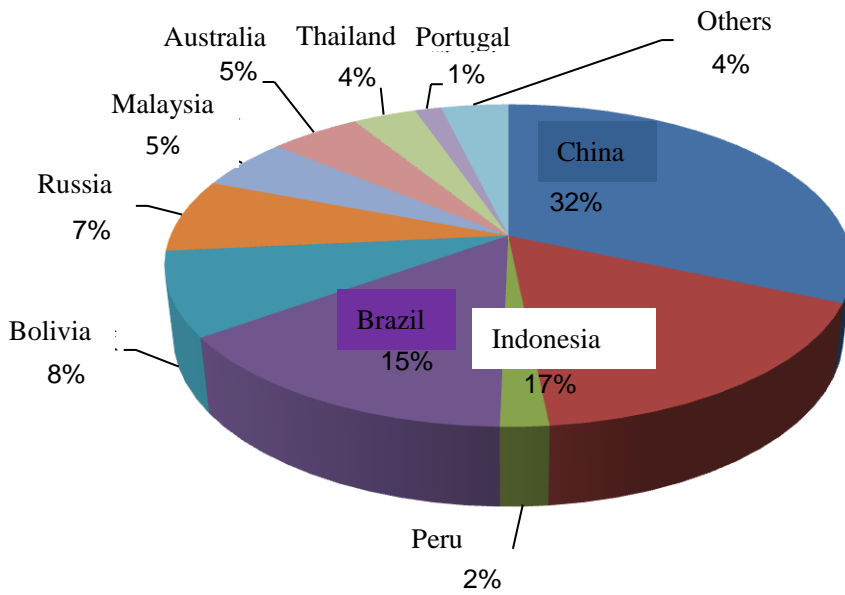
### **1.Tin Production**

#### **1.1Tin ore production**

The global tin resource is mostly distributed in China, Indonesia, Brazil, Bolivia and Russia. Together, they account for roughly 80% of the total global reserves. According to the data of the United States Geological Survey (USGS), the world tin basic reserve 2013 was 4.70 million tons, with most of them located in Asia and South America.

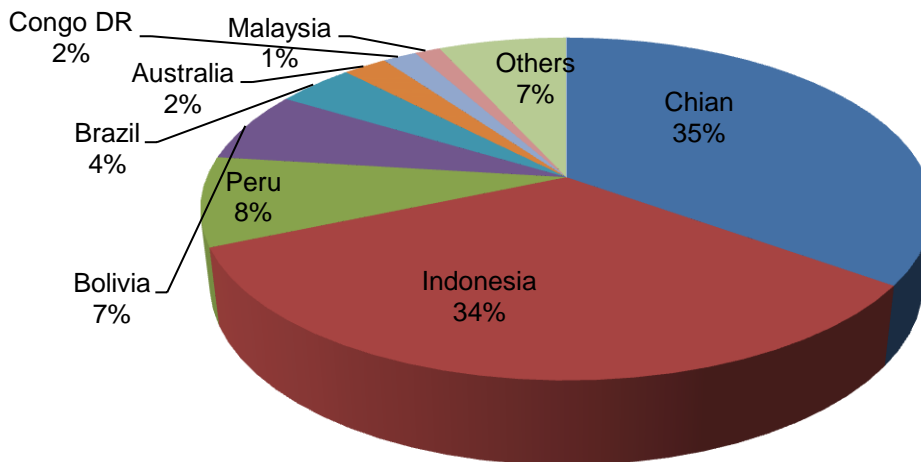
Currently China, Indonesia and Peru are the top three tin ore producers in the globe. The Antaike statistics indicate, the global tin ore production in 2013 was 281.2 KTA, and the tin ore production of the above top three producing nations accounted for 77% of the global production.

Chart 1: 2013 World Tin Resource Distribution



Source: Antaike

Chart2: 2013 Distribution of Production of Major Tin Suppliers in the World

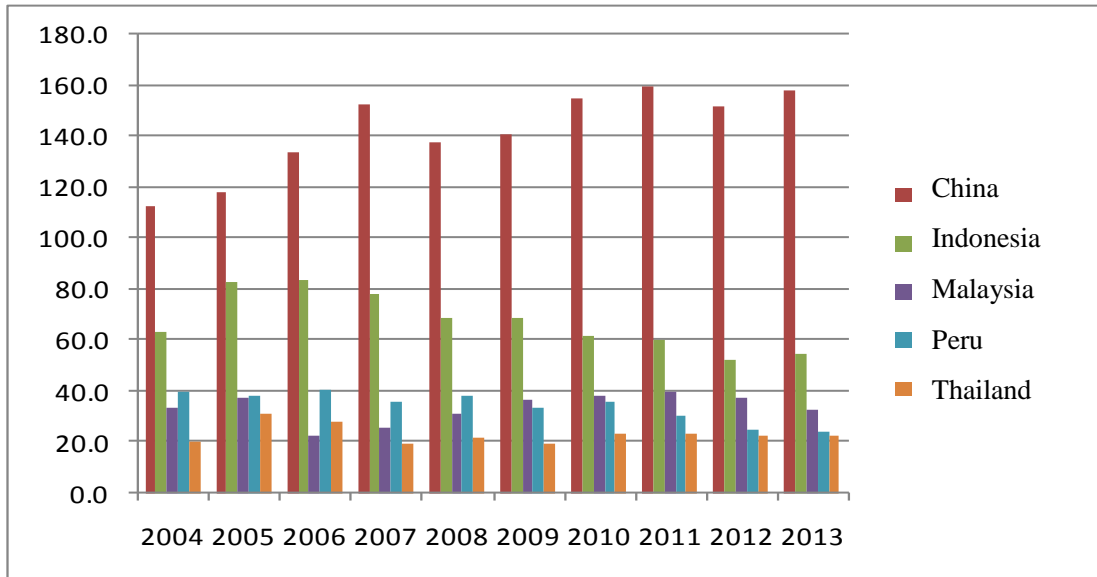


Source: Antaike

## 1.2 Refined Tin Production

In 2013, the global refined tin production was 340.8 KTA, with the top five producers being China, Indonesia, Malaysia, Peru and Thailand. The Malaysia and Thailand have almost exhausted their tin resources and heavily rely on tin concentrate and crude tin imports to maintain the production of refined tin.

Chart 3: 2004-2013 Refined Tin Outputs of Major Tin Suppliers in the World

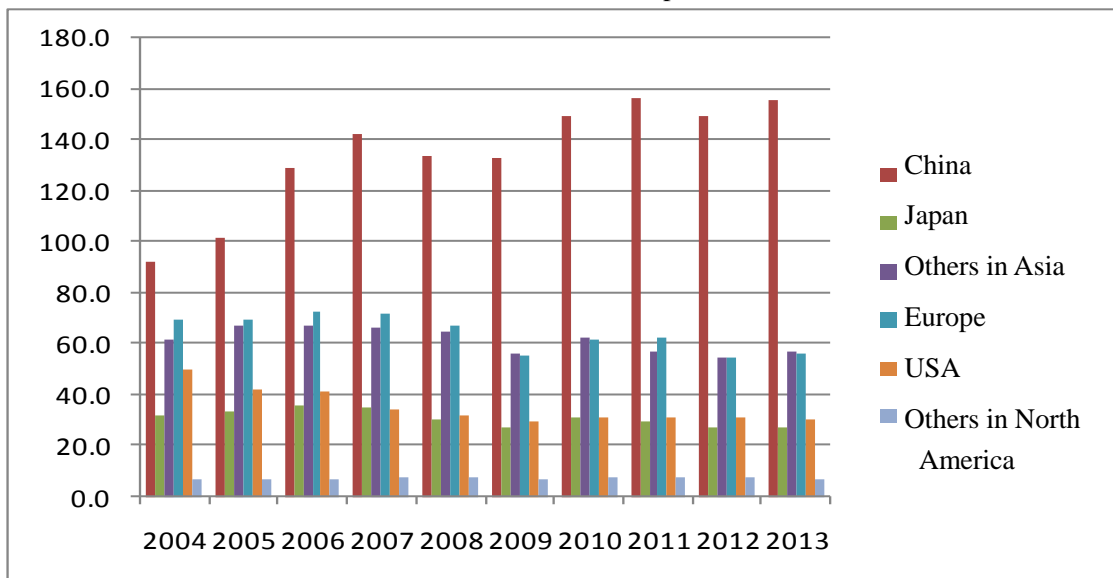


Source: International Association of Tin (IAT)

## 2. Tin Consumption

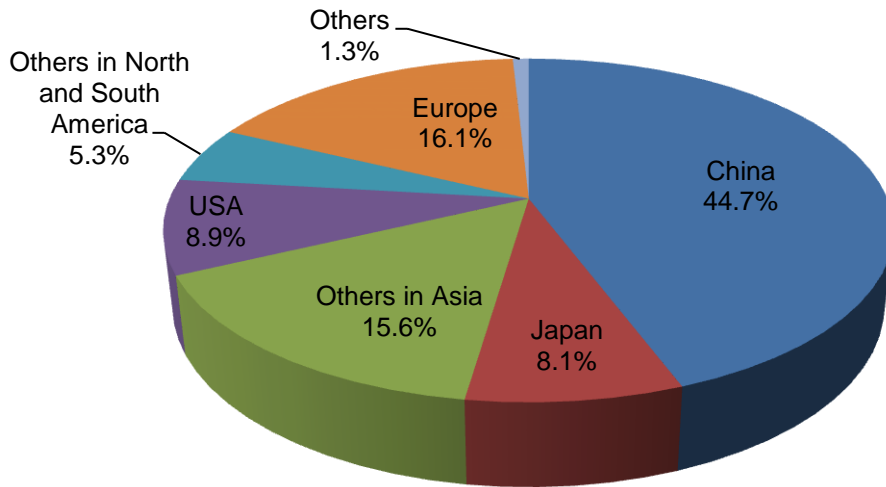
Most of tin supplied are consumed in China, USA, Japan and EU countries. As a result, the economic performance of these tin consumers has direct impact on the tin market. According to the statistics from International Association of Tin (IAT), in 2013 the world total tin consumption was 348.7KTA. China consumed 156 KTA, accounting for 44.7% of world consumption. The EU consumed 56.3 KTA, accounting for 16.1% of world total. The tin consumption in some traditional large consumers like the USA and Japan has been falling in recent years. Together, these two countries accounted for about 8% of world total consumption in 2013.

Chart 4: 2004-2013 Global Tin Consumption (in 1,000 tons)



Source: International Association of Tin (IAT)

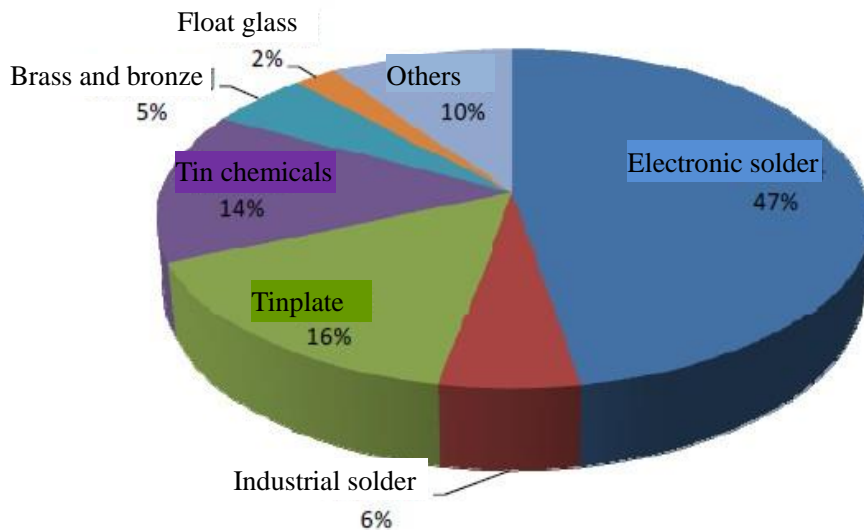
Chart 5: 2013 World Refined Tin Consumption



Source: International Association of Tin (IAT)

The tin consumption is mostly concentrated in solder, tinplate and tin chemicals. The consumption in sectors accounted for over 80% of world total tin consumption. See Chart 6 for consumption distribution by applications.

Chart 6: 2013 World Tin Consumption Distribution by Applications



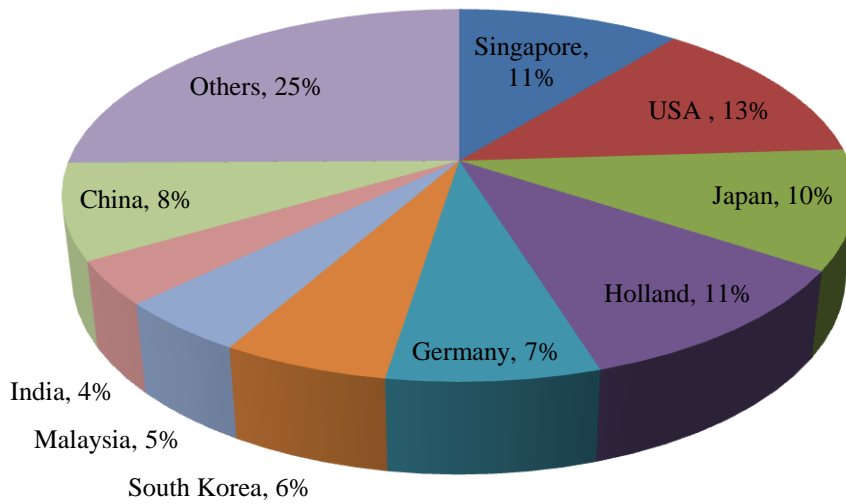
Source: Antaike

### 3. Tin Trade

The largest refined tin importers include the USA, Japan, Holland, Singapore, Germany, South Korea and other well-developed countries. Together, they account for 52% of world total tin import.

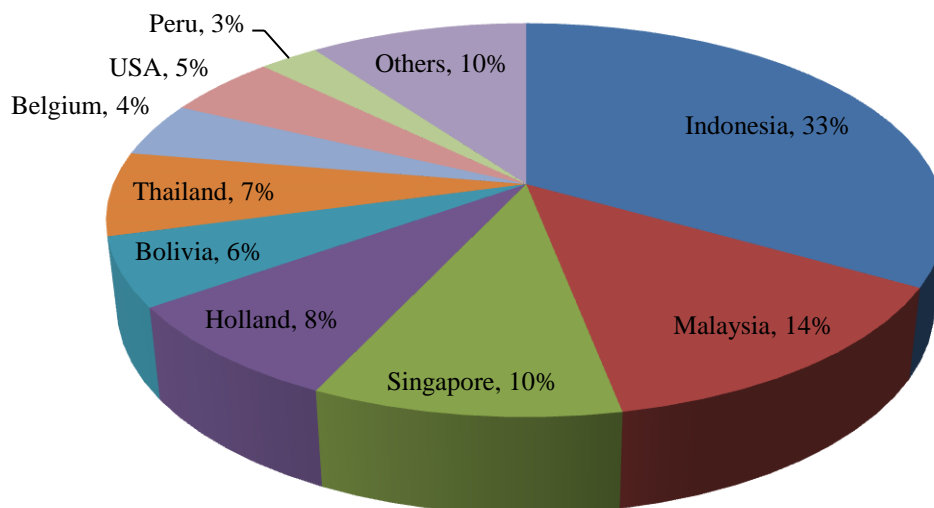
The largest refined tin exporters are those with rich tin resources. Together, Indonesia, Malaysia, Singapore and Thailand account for 64% of world total refined tin export.

Chart 7: 2013 Major Refined Tin Importers in the World



Source: Antaike

Chart 8: 2013 Major Refined Tin Exporters in the World



Source: Antaike

### III. Domestic Tin Market

#### 1. Tin Production

##### 1.1 Tin ore production

The tin mines in China are concentrated in Guangxi, Yunnan, Hunan, Jiangxi and Inner Mongolia provinces, the resource concentration is high. Currently in China the tin mining industry bases with Gejiu Yunnan, Dachang and Pinggui in Guangxi as backbone are formed. The production of tin concentrate (as converted to tin metal quantity) in China in 2013 was 102.1 KTA, accounting for roughly 35% of the global production.

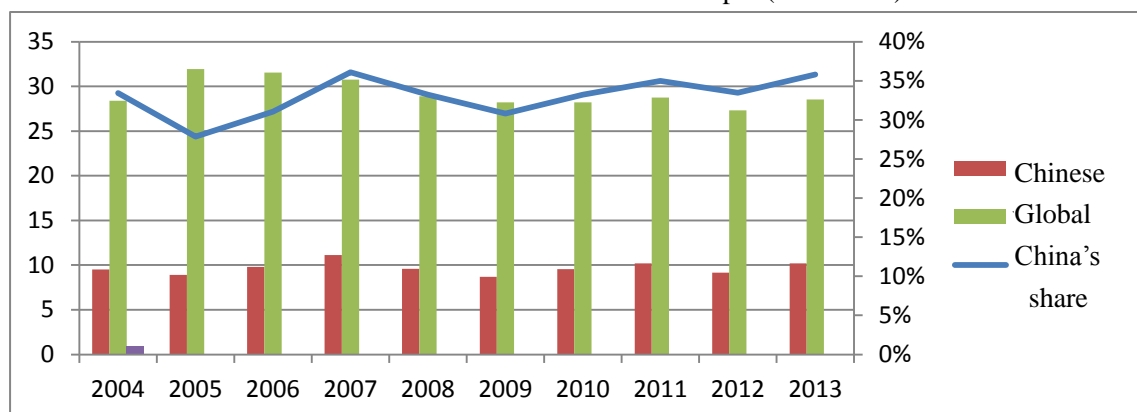
##### 1.2 Production Process

Modern tin smelting process is made up of 4 key steps: pretreatment of tin concentrate, reducing smelting, refining, and ash and slag treatment. There are two reducing smelting processes: electric furnace smelting and Ausmelt furnace. After that, we have crude tin (about 80% tin content) ready for refining. The refining can be done thermometallurgically or electrolytically. Eventually, we have the refined tin with tin content equal to or above 99.0%. The intermediate goods from a tin processing procedure include refined tin products, tin-lead solder ingots, tin-based casting alloy ingots, tin-based bearing alloy ingots, etc.

##### 1.3 Refined tin production

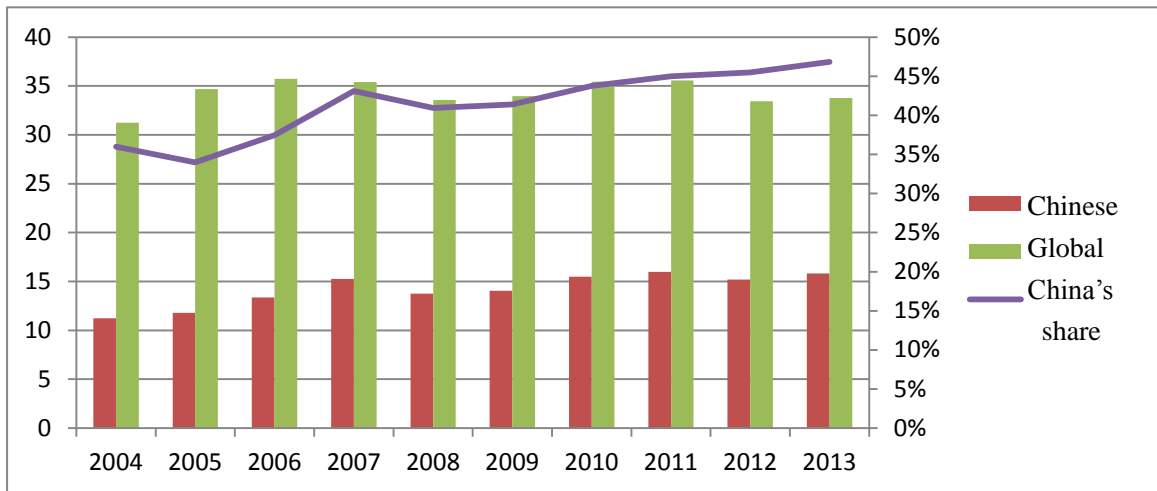
Just like Chinese tin resource distribution, the tin capacity and production in China are highly concentrated in the resource-rich regions, i.e. Yunnan, Guangxi, Hunan and Jiangxi provinces. Chinese total refined tin output was 158.1 KTA in 2013, with 99% of them coming from Yunnan, Guangxi, Hunan and Jiangxi provinces.

Chart 9: 2004-2013 Chinese Refined Tin Output (in 10 KTA)



Source: International Association of Tin (IAT)

Chart 10: 2004-2013 Chinese Refined Tin Output (in 10 KTA)

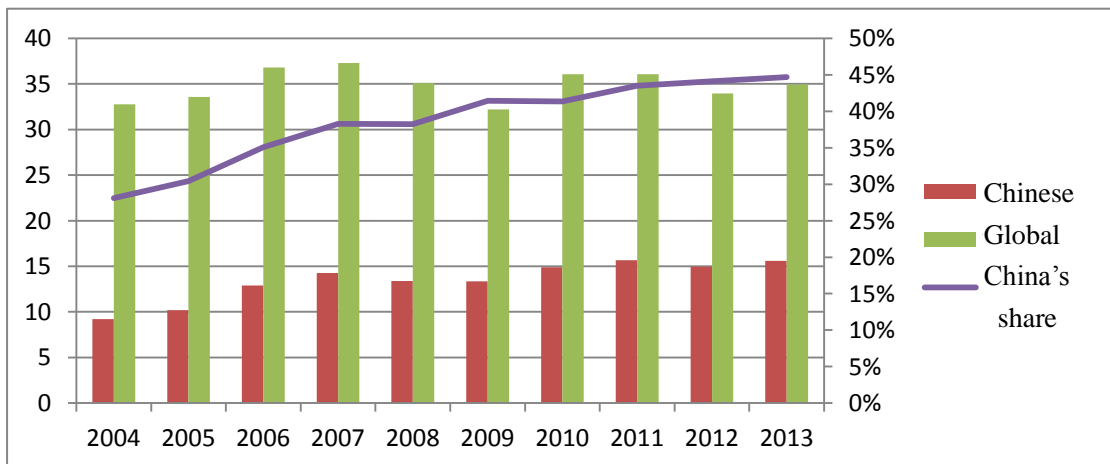


Source: International Association of Tin (IAT)

## 2. Tin consumption in China

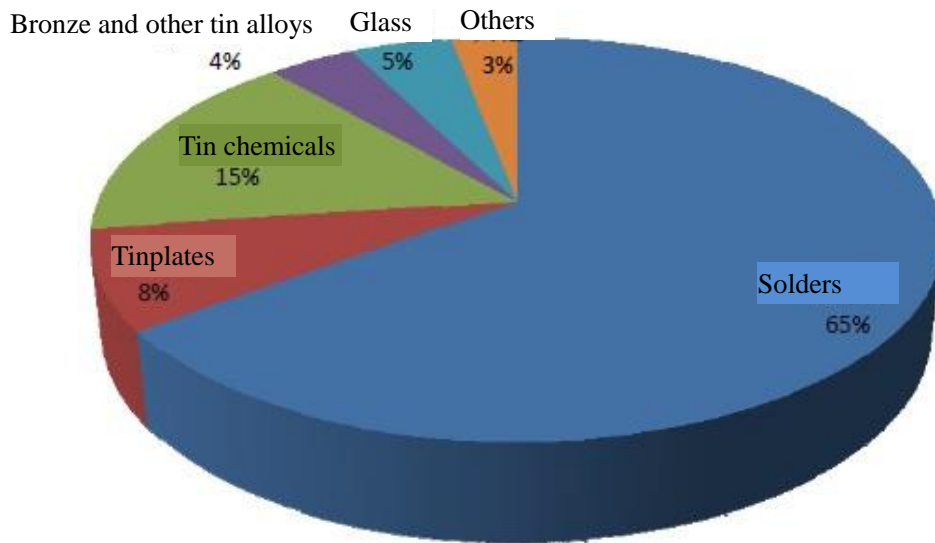
Tin consumption in China is mainly concentrated in sectors like solders, tin chemicals, tinplates, tin alloy (brass and bronze) and float glass. In the past decade, the industries where tin end users operate have been developing very fast. For example, the electronic communication industry (end user of tin solders) witnessed a growth of annual industrial added value as high as 28.51%. Also, tinplate output has been increasing by 16.94% per year and float glass output has been increasing by 12.53% per year. The fast development of these industries gave a powerful pulling the growth of domestic tin consumption. In 2013 the national tin consumption was 156.0 KTA, accounting for 44.7% of the global total.

Chart 11: 2004-2013 Tin Consumption in China (in 10KTA)



Source: Antaike

Chart 12: 2013 Chinese Tin Consumption Distribution

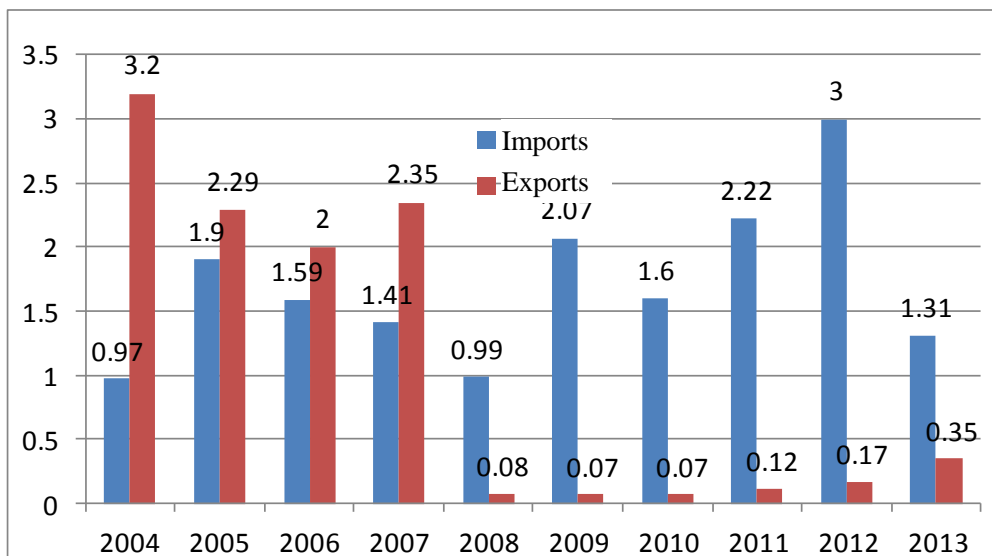


Source: Antaika

### 3. Tin Imports/Exports

China once was the largest refined tin exporter. Since 2002 the tin and tin product export quota management system was imposed, the export quota was reduced by year. Since 2008 China began to levy 10% tax on the exports, plus the booming domestic demand, in 2008 the refined tin export fell drastically, and imports exceeded exports, in 2008 China became a net importer of refined tin. In 2013 there was severe gap between domestic and international price, the imports fell considerably to 13.1 KTA, down by 56% year on year.

Chart 13: 2004-2013 Chinese Imports/Exports of Refined Tin (in 10KTA)



Source: China Customs



#### **IV. Key Factors Impacting Tin Price**

##### ➤ Supply-demand Relations

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. Tin 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 tin is one of the most important non-ferrous metals. The tin consumption is closely related to the economic performance. When the economy of a country or a region is developing rapidly, the tin consumption will increase, too. Similarly, a sluggish economy shall pull down the tin consumption in a number of industries and cause great turbulence on tin 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.

##### ➤ Import and Export Policy

Import/export policy is an important factor impacting the supply-demand relation.

Tin is the critical and strategic resource of China and the import/export policy on tin by state is to encourage imports and restrict exports. China imposed the export quota administration system for tin and tin products since 2002, and the export quota is reducing by year. Beginning from January 1, 2008, China imposed export tax for tin products, the tax rate is 20% on tin ore and concentrate, 10% for non alloy tin, and 10% on tin waste and scrap, in that year China became a net importer of tin.

Indonesia is the No 1 tin exporter globally. In 2013, its refined tin export accounted for 29% of world total trade volume. Its export policy plays critical role for the tin supply. For example, beginning from July 1, 2013, the Indonesia government specified the minimum purity spec for exports of refined tin by local tin smelters to be raised from 99.85% to 99.9%. The new regulation was issued on August 30 that all the tin ingots used for export from Indonesia must be traded at Indonesia Commodity and Derivative Exchange before export, the lifting of export threshold drastically cut the refined tin export from Indonesia.

##### ➤ Production cost

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

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

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

➤ Foreign exchanges

The US dollar, Euro and Japanese Yen are the three pillars of today's global foreign exchange market. And all of them are exchanged in floating exchange rate system. Since tin commodities are priced by US dollar on global markets, any change in the price parity of these three currencies will have a great impact on the tin price.