China’s Tungsten Resources and Mining Status

China Tungsten Industry Association

Liu Liangxian

2012.09.20
China's tungsten reserve, production, export and consumption rank the first respectively in the world. China, with less than 50% of the world tungsten resources, supplies more than 80% of the world tungsten consumption, and has made a great contribution to the world tungsten industry development.
Main Contents

- China's Tungsten Resources Situation
- China's Tungsten Mining Situation
- Development Trend
1 China's Tungsten Resources Situation

- China tungsten mines are mainly scheelite, supplemented by wolframite and mixed ores, and characterized by low grades, hard benefication, by-minerals, and high cost of mining.

- There still exists great potential in terms of China's tungsten resource, however, the economic reserve declines very fast, and the reserve-mining ratio loses its balance. In view of the resource endowment conditions, the mining status, and the industry's long-term strategic development, we are unable to be optimistic about the prospect of China's tungsten resource.
1 China's Tungsten Resources Situation

1.1 China's tungsten reserves:

According to the US Geological Survey Bureau, in 2010, the global tungsten reserve amounted to 2.9 million tons (metal contained), including China with 1.9 million tons equivalent to 65% of the global tungsten reserve.
1 China's Tungsten Resources Situation

1.1 China's tungsten reserve:

The global tungsten resources mainly exist in China, Russia, US, Canada, and Bolivia, and the five countries have 85% of the global reserve.

According to China Land and Resources Ministry, China takes up less than 50% of the global tungsten reserve.
China's Tungsten Resources Situation

1.2 China's tungsten resources distribution:

China's tungsten resources are distributed in 23 provinces (cities, autonomous regions), according to a rough estimate, there are 382 tungsten deposits across the country.
1 China's Tungsten Resources Situation

1.2 China's tungsten resources distribution:

Seven provinces (regions) such as Jiangxi, Hunan, Guangdong, Yunnan, Inner Mongolia, Guangxi, Fujian, have 80% of the tungsten mining areas nationwide.
1 China's Tungsten Resources Situation

1.3 China's tungsten ore types:

There are three main types of tungsten ore:

- Wolframite \([\text{Fe, Mn}W_O_4]\);
- Scheelte \((\text{CaWO}_4)\);
- Woframite-Scheelite Co-existing ore.
1 China's Tungsten Resources Situation

1.4 Characteristics

Three main characteristics

- Centralized Distribution
- Largest reserves of scheelite
- "Three highs and one low"
1 China's Tungsten Resources Situation

1.4 Characteristics

Collective distribution

China's tungsten resources are mainly distributed in eight provinces (regions), such as Hunan, Jiangxi, Henan, Gansu, Guangdong, Guangxi, Fujian, Yunnan, accounting for 85% of the total proven amount nationwide. Among them, Hunan ranks the first, accounting for 32% of the national total.
1 China's Tungsten Resources Situation

1.4 Characteristics

Mostly scheelite:

Scheelite accounts for 68.54% of the total proven tungsten reserve, wolframite 22.20%, and the scheelite-wolframite mixed ore 9.26%.
1 China's Tungsten Resources Situation

1.4 Characteristics:

"Three highs and one low":
- High proportions of low grade mines, minerals hard for beneficiation, and mineral co-existing mines;
- Low production recovery.

80% of the scheelite mines have geological grades lower than 0.4% with complex compounds, and associated deposits account for 70% of the total scheelite mines.

Under the existing technical conditions, the beneficiation recoveries of most scheelite mines are less than 65%, which is 15%~20% lower than wolframite mines.
1 China's Tungsten Resources Situation

1.5 China’s tungsten resource consumption:

China’s basic tungsten reserve decreased by 21.47% in 2010 compared to 2001; proven reserve increased by 1.32%.
1 China's Tungsten Resources Situation

1.5 China's tungsten resource consumption

The basic reserve of wolframite decreased by 51.01% in 2010 over 2001, and its proportion in the total basic reserve declined from 30.05% to 18.75%.

Tungsten mining needed much intensive work in China while the reserve-mining ratio went down constantly. The ratio in 2010 was only 19.5 years, less than 1/4 of other countries, a decrease by 19.6 years over 2001.
2 China's Tungsten Mining Situation

2.1 China's tungsten mining and dressing capability:

In 2010: (converted into tungsten metal)

Mining capability: 56,000 t/y, growth by 33.33% over 2006.

Dressing capability: 75,000 t/y, growth by 25.00% over 2006.
2 China's Tungsten Mining Situation

2.2 China tungsten mining production:

Since the first discovery of tungsten in Dayu, Jiangxi in 1907, China has been mining tungsten for a history of over 100 years.

Production in 1914: less than 10 tons (converted into tungsten metal)

Production in 1918: 5,020 tons (tungsten metal), 33.1% of the global amount and ranking first in the world;

In the following years, China’s tungsten production ranked the world first with only few exceptions.
2 China's Tungsten Mining Situation

2.2 China tungsten concentrate productions:

Table 1  China production  Unit: 10,000 tons (W metal)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>world</td>
<td>37.78</td>
<td>224.72</td>
<td>56.27</td>
</tr>
<tr>
<td>China</td>
<td>11.26</td>
<td>105.29</td>
<td>44.75</td>
</tr>
<tr>
<td>China proportion %</td>
<td>29.80</td>
<td>46.85</td>
<td>79.53</td>
</tr>
</tbody>
</table>
2 China's Tungsten Mining Situation

2.2 China tungsten concentrate productions:

Chart 7 China's tungsten concentrate productions (1949-2010)
2 China's Tungsten Mining Situation

2.2 China tungsten concentrate productions:

According to the "World Metal Statistics", the global concentrate production in 2010 was 58,803 tons (metal contained, and China's production was adjusted).

Among that, China produced 51,250 tons, 87.2% of the world total and a growth of 8.75% over 2009.
2 China's Tungsten Mining Situation

2.2 China's tungsten concentrate productions

Concentrates are mainly produced in Jiangxi and Hunan, and in recent years, Henan province's production increased a lot. The total amount of the three provinces accounts for 84% of the whole country.

According to a rough statistic, China's tungsten concentrate production was 62,800 tons (W metal).
2 China's Tungsten Mining Situation

2.2 China's tungsten concentrate productions:

<table>
<thead>
<tr>
<th>Country (Region)</th>
<th>China</th>
<th>Russia</th>
<th>Bolivia</th>
<th>Austria</th>
<th>Rwanda</th>
<th>Portugal</th>
<th>Peru</th>
<th>Other countries</th>
<th>Global</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>51250</td>
<td>1800</td>
<td>1518</td>
<td>976</td>
<td>820</td>
<td>735</td>
<td>716</td>
<td>988</td>
<td>58803</td>
</tr>
<tr>
<td>Proportion%</td>
<td>87.2</td>
<td>3.1</td>
<td>2.6</td>
<td>1.7</td>
<td>1.4</td>
<td>1.2</td>
<td>1.2</td>
<td>1.7</td>
<td>100.0</td>
</tr>
</tbody>
</table>
2 China's Tungsten Mining Situation

2.3 China's tungsten export:

**WTO:**

Retains China's state-run trade administration right on 13 tungsten products, and limited number of companies are qualified by the government for the business.

Now, there are 13 companies qualified for the export of tungsten.
2 China's Tungsten Mining Situation

2.3 China's tungsten products export:

Starting from 2000, China carried out the quota administration over the primary and intermediate tungsten products, and about 3% quota reduction was witnessed annually.
2 China's Tungsten Mining Situation

2.3 China's tungsten products export:

Table 3 The export quotas for tungsten products from 2001-2012

<table>
<thead>
<tr>
<th>Year</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quota (W)</td>
<td>17000</td>
<td>18200</td>
<td>16300</td>
<td>16000</td>
<td>16300</td>
<td>15800</td>
</tr>
<tr>
<td>Year</td>
<td>2007</td>
<td>2008</td>
<td>2009</td>
<td>2010</td>
<td>2011</td>
<td>2012</td>
</tr>
<tr>
<td>Quota (W)</td>
<td>15400</td>
<td>14900</td>
<td>14600</td>
<td>14300</td>
<td>15700</td>
<td>15400</td>
</tr>
</tbody>
</table>

Note: After 2010, foreign-funded enterprises quotas included.
2 China's Tungsten Mining Situation

2.3 China's tungsten products export:

In recent 5 years, except 2009 when the tungsten export declined due to the world financial crisis. China's yearly export averaged around 30,000 tons, accounting for 80% of the overseas consumption.

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global consumption</td>
<td>69500</td>
<td>64600</td>
<td>63100</td>
<td>52656</td>
<td>63389</td>
</tr>
<tr>
<td>China’s consumption</td>
<td>24000</td>
<td>25000</td>
<td>26000</td>
<td>27500</td>
<td>30000</td>
</tr>
<tr>
<td>Foreign consumption</td>
<td>45500</td>
<td>39600</td>
<td>37100</td>
<td>25156</td>
<td>33389</td>
</tr>
<tr>
<td>China’s tungsten export</td>
<td>34254</td>
<td>33065</td>
<td>30378</td>
<td>18409</td>
<td>29996</td>
</tr>
<tr>
<td>Proportion of export over foreign consumption %</td>
<td>75.28</td>
<td>83.50</td>
<td>81.88</td>
<td>73.18</td>
<td>89.84</td>
</tr>
</tbody>
</table>

Table 4 The comparison between the export volume of China’s tungsten products and overseas tungsten consumption
Unit: tons (W metal)

数据来源：ITIA、CTIA。2010年全球消费为预计数。
2 China's Tungsten Mining Situation

2.3 China's tungsten products export:

Chart 10 China's tungsten products export and foreign tungsten consumption (2003–2010)
3 Development Trends

3.1 Analysis of China’s tungsten resources potential:

The Chinese Government attaches great importance to the geological prospecting of tungsten and comprehensive utilization of tungsten resources.

The Standing Committee of State Council approved the “Strategic Breakthrough Action Outline of Mineral Prospecting (2011-2020)”;

China Land and Resources Ministry issued the “The Twelfth Five-year Plan on Mineral Resources Conservation and Comprehensive Utilization”.
3 Development Trends

3.1 Analysis of China’s tungsten resources potential:

There exists a quite big potential for China’s tungsten reserves.

Southern Jiangxi Province, northern Guangdong Province and southern Hunan Province: new deposits were found in old mines such as Xihuashan, Maoping, Taoxikeng, Dajishan, Hukeng, Yaogangxian, Huangshaping and Jiangxi Wuning tungsten mining area.

Breakthroughs have been achieved due to more efforts on geological exploration in better potential areas like Southern An’hui (Western Zhejiang), Middle Jilin--Yanbian, North Qilian Mt., Xinjiang--Qinghai Qimantage, and Northern Xizang Jia gang.
3 Development Trends

3.1 Analysis of China’s tungsten resources potential

Though China's tungsten reserve takes an advantageous position in the world, the resources are consumed in a very fast speed due to over-exploitation. In view of the resource endowment conditions, the mining status, and the industry's long-term strategic development, we are unable to be optimistic about the prospect of China's tungsten resource. The resource advantage is gradually fading, and the resources safety faces a serious problem.
3 Development Trends

3.2 China’s tungsten mining trends

Chinese government put more and more attention to the health, safety and environmental issues regarding to the tungsten mining, smelting and processing. Starting from the year 2002, mining quotas were imposed on the tungsten mining. The production from each mining area has remained more or less stable since 2005.
3 Development Trends

3.2 China’s tungsten mining trends

The total tungsten mining production for four consecutive years remained at about 50,000 tons (converted into tungsten metal). A growth of 12.3% was witnessed in the “Eleventh Five-Year” period compared to the “Tenth Five Year” period.
3 Development Trends

3.2 China's tungsten mining trends:

Four outstanding trends:

(1) The tungsten exploitation presents a capital-diversified, large-scaled, integrated, and standardized development, with a stable mining production.

(2) Production under control in several formerly large-scale mining areas.

(3) Ratio between wolframite and scheelite concentrate production has changed.

(4) Mining costs increased.
3 Development Trends

3.2 China's tungsten mining trends:

(1) The tungsten exploitation presents a capital-diversified, large-scaled, integrated, and standardized development, with a stable mining production.

Due to the integration of tungsten resources, the number of the mining companies was reduced from 143 in 2005 to 132 in 2009, and the number of medium and large-sized tungsten mines increased from 12 in 2005 to 27 in 2009.
3 Development Trends

3.2 China's tungstun mining trends:

(2) Production under control in several formerly large-scale mining areas.

Productions are under good control in the tungsten mining areas such as Hunan Xintianling, Yunnan Malipo, Guangxi Quanzhou, southern Jiangxi and Hunan Rucheng.
3 Development Trends

3.2 China's tungsten mining trends:
   (3) Ratio between wolframite and scheelite concentrate production has changed.

   The ore grade of Chinese wolframite decreased while the consumption increased, and the production reduced; the production of low grade deposits difficult for dressing and recycling of co-existing tungsten deposits and wolframite-scheelite mixed tungsten deposits increased to some extent. For example, the tungsten recycling amount in Henan Luanchuan molybdenum mining with tungsten co-existence has surpassed 10,000 tons. The ratio between wolframite and scheelite concentrate production declined from 7:3 in/ before 2007 to currently 6:4.
3 Development Trends

3.2 China's tungsten mining trends:

(4) Mining costs increased

Generally increasing labor cost in tungsten mining, construction of underground safety system, ecological environment control and recovery, construction of environmental-protection on-line monitoring system, gradually increasing investments into deeper and surrounding exploration and infrastructure, and decreasing average ore grade are all the reasons for increasing mining costs.
3 Development Trends

3.3 The export trend of China’s tungsten products

The primary and intermediate tungsten products are under the control of export administration, but the total tungsten export amount increases.

According to the Customs' statistics:

- 23,691.3 tons of tungsten products were exported in 2000, and 27,537.2 tons in 2011, increased by 16.23% and annual average growth of 1.38%;

- 911.8 tons of cemented carbides exported in 2000, and 4,028.9 tons in 2011, increased by 341.8% with an annual average growth of 14.46%;

- A total amount of 24,603.1 tons of tungsten products including cemented carbides exported in 2000, and 31,565.9 tons in 2011, increased by 28.30% with an annual average growth of 2.29%.
Conclusions

- Over-exploitation, fast consumption of economic reserve, fading resource advantage despite of big potential, and unable to be optimistic about the resource safety status;
- The tungsten exploitation presents a capital-diversified, large-scaled, integrated, and standardized development;
- The recycling amount of coexisting tungsten, low-grade tungsten and tailing containing tungsten increased while the amount of wolframite concentrate production decreased. The total tungsten mining production becomes stable. The supply of Chinese tungsten resources tends to be "balanced but a little tight, stable and rational, controlled in a orderly way". The supply flexibility reduces in the tungsten market.
Conclusions

- The export of tungsten products keeps on increasing and the mining cost increases. It will be an inevitable trend for the tungsten market price to gradually return and rise to a reasonable level, and this also complies with the general tendency that the social exchange value of environmental resources will constantly increase.
THANK YOU ALL!

CHINA TUNGSTEN INDUSTRY ASSOCIATION
Room. 622, No. 12 Fuxing Road, Beijing 100814 China
TEL/FAX : +86-10-63980556
Mobile:+86-13511035339
E-mail: liulx_ctia@163.com

WWW. CTIA.COM.CN