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The Rise of Yunnan's Titanium Industry Comes at the Right Time

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Against the backdrop of intensifying global competition in high-end manufacturing and domestic industrial structure upgrading, the titanium industry, as a vital component of the new materials sector, is ushering in a new wave of development opportunities. From titanium ore mining and beneficiation to high-end titanium product manufacturing, and from low-level, disorderly exploitation to green and innovative advancements, Yunnan Province is accelerating the layout of its titanium industry chain, leveraging its abundant titanium resources, clean energy advantages, and geographical strengths. With the vision of a "Green Titanium Valley," it has emerged as a new force in China's titanium industrial landscape.

Clustered Enterprise Development

An Increasingly Refined Industry Chain

At the LB Group's Yunnan base in Qingfeng Town, Lufeng City, Chuxiong Yi Autonomous Prefecture (hereinafter referred to as "Chuxiong Prefecture"), the 3,500-acre facility is meticulously arranged. In the packaging workshop of LB Lufeng Titanium Co., Ltd., chlorination-process titanium dioxide is fully automated and isolated during bagging, with rows of conveyor belts neatly stacking the packaged titanium dioxide. Daily, 380 mt of titanium dioxide is shipped from here. Over the past four years, driven by technological upgrades and innovation, the operational stability of the company's chlorination-process titanium dioxide production line has significantly improved, with both production and output value steadily increasing for four consecutive years. Production rose from 40,000 mt in 2020 to 121,000 mt in 2024, while output value grew from 1 billion yuan in 2020 to 2.44 billion yuan in 2024.

Titanium is hailed as the "third metal" following iron and aluminum, rapidly rising in prominence, and is also celebrated as the space metal, ocean metal, bio-metal, and future metal. The global titanium industry has only an 80-year history, and due to the complexity of titanium metallurgy, only a few countries—such as the US, Russia, Japan, and China—have established comprehensive titanium industrial research and application systems.

Yunnan Province boasts unique titanium resources with exceptionally favorable mining conditions. By 2020, 66 titanium ore deposits had been discovered in the province, with proven reserves of 55.61 million mt, ranking third nationally. These resources are primarily distributed in central, southern, and western Yunnan. Among them, the central Yunnan mining area, located at the intersection of southern Yunnan, western Yunnan, and the Panzhihua mining area in Sichuan, serves as the central hub of titanium resource distribution in south-west China. This region is densely surrounded by titanium industries, having developed and formed the Fumin titanium salt industrial base, represented by sulfate-process titanium dioxide; the Lufeng titanium industrial base, characterized by chlorination-process titanium dioxide, sponge titanium, and titanium processing; and the Wuding titanium industrial base, known for its production of high-titanium slag and other titanium-rich materials. In 2021, the green titanium industrial cluster jointly developed by Lufeng City and Wuding County received provincial recognition and support as a cultivation-type advanced manufacturing cluster. Recently, it was also included in the development scope of the central Yunnan rare and precious metals new materials industrial cluster, earning national-level recognition as an advanced manufacturing cluster.

Benefiting from its superior transportation, geographical location, and solid industrial foundation, the titanium industry in Chuxiong Prefecture has flourished. Currently, Chuxiong Prefecture has gathered over 30 titanium industry enterprises, forming a complete industry chain from titanium ore mining and beneficiation to the production of high-titanium slag, chloride-process titanium dioxide, titanium sponge, and titanium materials. It has become the only region in China and even globally with a complete titanium industry chain.

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In Lufeng City, the titanium industry has clustered, forming a collective development trend.

In May 2019, Yunnan Metallurgical Xinli Titanium Industry Co., Ltd., which was on the verge of bankruptcy, was acquired by Lomon Billions Group. After restructuring, it received support from LB Group Co., Ltd. in various aspects such as talent cultivation, technological transformation, and technological innovation. "In 2023, the company's 200,000 mt chloride-process titanium dioxide project was completed and put into operation, and it has now become a leading enterprise in the titanium dioxide industry in Yunnan Province," Liu Hongxing, Chairman of LB Lufeng Titanium Industry Co., Ltd., told the author.

Yunnan Guotai Metal Co., Ltd., also a subsidiary of LB Group, is mainly engaged in the production, R&D, and sales of titanium sponge. It has initially established a full-process industry chain of "titanium ore - titanium concentrate - high-titanium slag - titanium tetrachloride - electrolytic magnesium - titanium sponge," with an existing annual production capacity of 80,000 mt of high-titanium slag and 50,000 mt of titanium sponge, ranking first in the world in terms of titanium sponge production capacity. In 2024, the company's 30,000 mt/year rotor-grade titanium sponge production project reached full production, with an annual production capacity of 50,000 mt.

Yunnan Titanium Industry Co., Ltd., located in Tuguan Town, Lufeng City, mainly produces titanium and titanium alloy casting ingots, titanium coils, titanium rod wires, and titanium wide and thick plates. In 2024, the company's production and sales volumes were both around 3,000 mt. Liu Kun, Deputy General Manager of the company, stated that with the continuous and rapid development of the titanium industry chain's process technology, the production and sales volumes of titanium products produced by the enterprise have steadily increased, and their application fields are rapidly expanding. The excellent metallic properties of titanium provide indispensable support for key fields such as aerospace, marine vessels, metallurgical and chemical engineering, medical devices, sports and leisure, and civilian products. The company focuses on the R&D of new titanium and titanium alloy products and the extended processing of titanium materials, actively applying its unique advantages to more fields.

As of 2023, there were over 150 enterprises in Yunnan Province's titanium industry, with nearly 50 key producers. The total industrial output value of the titanium industry amounted to 11 billion yuan, of which 8.86 billion yuan was in Chuxiong Prefecture and 2.14 billion yuan was in Kunming.

Enhancement of Innovation Capabilities

Continuous Growth in Development Potential

The preciousness of titanium mainly lies in its complex smelting process and high processing costs. Yunnan Province's titanium industry started relatively early, but due to limitations in talent, technology, capital, and institutional mechanisms, its development was relatively slow, and it remained in a state of low-level and disorderly development for a long time before the "13th Five-Year Plan" period.

Seizing the opportunity presented by the green energy advantages under the "dual carbon" goals and the emergence of new growth points in titanium material applications, the Yunnan Provincial Party Committee and Provincial Government have attached great importance to the cultivation of the new materials industry, taking multiple measures to promote the transformation and upgrading of the titanium industry.

A group of leading enterprises are driving the rebirth of the "Titanium Valley" in central Yunnan, aiming to expand, strengthen, and optimize the titanium industry. Under the leadership of LB Group, LB Lufeng Titanium Industry Co., Ltd. has carried out a series of technological transformations and innovations: innovating the feeding system to address issues of feeding stability and precise measurement; optimizing the refined control of the cyclone system to solve the long-standing problem of cyclone blockages that affected the continuous and stable operation of the system within the industry; and improving the process control parameters of the oxidation reaction to stabilize the quality of titanium dioxide base materials. Alongside the technological transformations for production resumption, the company has delved deep into the coupled mode of two chlorination processes, addressing not only the environmental protection issues related to wastewater treatment in titanium dioxide production but also significantly reducing the alkali consumption for treating the off-gas from the chlorination of titanium sponge in molten salt, saving over 10 million yuan annually and achieving a "1+1>2" complementary advantage between the two processes.

At the LB Yunnan base, a centralized digital control system has integrated the scattered control systems from various workshops into a control building, enabling "interlocked" remote control and setting reasonable parameter values and operating procedures, allowing employees to easily control production.

According to a relevant official from the Yunnan Provincial Department of Industry and Information Technology, as of 2023, there are over 20 innovative enterprises in the central Yunnan titanium industry, including 7 technology-based small and medium-sized enterprises, 5 high-tech enterprises, 2 provincial-level and above specialized and sophisticated "little giant" enterprises, and 1 national-level technological innovation demonstration enterprise. The number of effective invention patents per 100 million yuan of main business income for industrial enterprises above designated size has reached 1.27, 65% higher than the national average.

Industry insiders have stated that Yunnan's titanium industry fully leverages its advantageous conditions, including resource advantages, complete industry chain advantages, industry-university-research collaboration advantages, and geographical advantages. Through rational layout and emphasis on key areas, it has formed a titanium industry cluster with upstream-downstream integration and industry-university-research collaboration, accelerating the R&D, production, and application promotion of titanium materials in fields such as aerospace, marine vessels, metallurgical and chemical engineering, military equipment, and civilian products, aiming to achieve rapid and comprehensive development of Yunnan's titanium industry.

To address the shortage of high-end technical talents, in 2024, the Lufeng Municipal Government, in collaboration with Kunming University of Science and Technology, will jointly establish a Modern Industry College for Green Titanium and a Titanium Industry Research Institute, providing strong technical support for talent cultivation, industry-education integration, integration of science and education, industry-university-research collaborative innovation, and industrial technology breakthroughs in the regional titanium industry.

According to relevant personnel from the Chuxiong Prefecture Bureau of Industry and Information Technology, in 2025, Chuxiong Prefecture will promote the "green electricity + advanced manufacturing" model across the entire industrial chain, fostering advantageous industrial clusters such as green titanium. Focusing on the entire chain of "resources - smelting - intensive and deep processing," it will accelerate the construction of seven projects aimed at complementing, extending, and strengthening the titanium industry chain, including the boiling chlorination raw material project, the Zhongzhou Carbon Materials project, and the Dongkai Vanadium-Scandium Resources Comprehensive Utilisation project. Additionally, centering on the intensive and deep processing of 80,000 mt of titanium sponge by LB Group and Guotai Metal Company, it will expedite the cooperation between Yunnan Titanium Industry Co., Ltd. and Yunnan Precious Metals Group to develop high-end titanium alloys and composite materials, thereby expanding enterprise products into fields such as aerospace, military industry, medical treatment, electricity, chemicals, and water treatment.

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