

# TITANIUM

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The titanium pigment market began to recover from late 2003, after two years of depression. But in the feedstock market, a broad-based improvement was hampered by persisting surplus inventories of chloride slag.

## **TiO<sub>2</sub> pigment**

Titanium dioxide pigment accounts for more than 90% of the consumption of titanium minerals. TiO<sub>2</sub> is the brightest of the white pigments and its main applications are in the manufacture of paint, paper and plastics. Consumption is concentrated in North America and Europe, which account for more than half of the world's demand. But Chinese consumption is growing rapidly.

A series of mergers and acquisitions have resulted in consolidation of ownership in the TiO<sub>2</sub> pigment industry. The top four producers (DuPont, Millennium Chemicals Inc, Huntsman Tioxide and Kerr-McGee Chemical) now account for 60% of pigment production capacity.

There are two broad groupings of pigment production technologies, which have different operating characteristics and different feedstock requirements. Plants employing a chloride process consume high TiO<sub>2</sub> content feedstocks such as synthetic rutile and chloride slag. Chloride plants owned by DuPont are also capable of using certain ilmenites. Sulphate process plants utilise lower-grade ilmenite and sulphate slags. Most of the growth in world capacity is in plants employing a chloride process.

World pigment production increased by 3.4% in 2003 (according to estimates prepared by industry consultants TZMI), following a 4.1% recovery in 2002 from the slump of the previous year. However, indications are that consumption growth was more subdued, and that pigment inventories accumulated.

US consumption declined by 4% in 2003, based on data from the US Geological Survey, although consumption staged a marked improvement in the fourth quarter.

Pigment prices declined steadily through most of the year, but began to rise in the fourth quarter and into early 2004. Increases of US\$200-300/t (10-15%) have been posted in most regions, although Europe appears to be lagging.

After the hectic pace of merger and acquisition activity in prior years, 2003 was relatively quiet. However, in March 2004 Lyondell Chemical Co launched a bid for Millennium Chemical. Lyondell has no existing TiO<sub>2</sub> business, although the companies do have synergies elsewhere.

A number of producers have announced plans to increase chloride pigment plant capacity. Kerr-McGee will increase capacity at the Hamilton plant in Missouri, from 200,000 t/y to 225,000 t/y, and in Georgia the Savannah chloride plant capacity will be increased from 91,000 to 110,000 t/y. In India, KMML implemented a 40,000 t/y expansion at its Quinlon plant. In early 2004, Kronos announced plans to add 25,000 t/y of capacity spread over a number of its plants.

Whereas chloride pigment capacity continues to expand, a number of reductions in sulphate capacity have been announced. In early 2004, Huntsman announced curtailment of capacity at its sulphate plants at Grimsby, UK, which will be reduced by half to 40,000 t/y. In South Africa, capacity at the Umbogintwini plant will be reduced from 40,000 t/y to 25,000 t/y. In Japan, the long-term declines in pigment plant capacity continued, with the closure of the small Furukawa plant (7,000 t/y). Only in China is sulphate capacity increasing, expansions totalling at least 30,000 t/y having been announced.

### **Titanium metal**

More than half of the world's titanium sponge production capacity is located in the CIS, with Avisma in Russia, and UKTMP in Kazakhstan being the largest producers, although the effective maximum output of these plants is much less than nominal capacity. After the CIS, Japan is the second-largest producing country. In 2003, world production declined by about 9%, as demand from the commercial aerospace industry was weak and consumers de-stocked.

### **Titanium feedstocks**

Consolidation of ownership has been a dominant trend in the TiO<sub>2</sub> feedstock market in past years. Together, the four largest participants, Rio Tinto plc (through its 50% holding in Richards Bay Minerals, and 100% of QIT Canada), Iluka Resources, BHP Billiton (which owns the other 50% of Richards Bay Minerals) and Ticor (50% of Tiwest and 40% of Ticor South Africa), control 60% of feedstock production capacity.

In South Africa, Anglo American Corp (which owns Namakwa Sands) increased its stake in Kumba Resources (the jv partner with Ticor in Ticor South Africa) to 67%. The main driver behind the move was Anglo's interest in Kumba's iron ore operations and the implications for ownership of the mineral sands operations is not yet clear.

In Australia, the mineral sands assets of Nishio Iwai and Sons of Gwalia Ltd were merged into BeMaX Resources NL. RZM Cable Sands (100% owned by Nishio Iwai) and Murray Basin Titanium (50% Nishio Iwai, 50% Sons of Gwalia) are now wholly owned by BeMaX.

The most significant change in feedstock production capacity was the permanent closure in the US of Kerr-McGee's 200,000 t/y capacity synthetic rutile plant in Mobile, Alabama, in June 2003.

Ticor South Africa ramped up production from the Empangeni facility. By October 2003, capacity utilisation of the first furnace reached 70%, and commissioning of the second furnace began. Ultimate capacity of the two furnaces will be 250,000 t/y.

At the existing major operations, slag output at Richards Bay Minerals was cut back to about 75% of capacity, continuing the curtailment implemented in 2002. The reduced production is being driven by reduced demand for chloride slag. However, synthetic rutile production by Iluka Resources was increased. At its US operations, Iluka opened a new mine at Lulaton, Georgia, in early 2004. Mineral processing will be at Green Cove Springs, Florida, and dredging operations at Green Cove Springs will cease.

In India, production of sulphate ilmenite increased in Tamil Nadu through expansions by VV Minerals and Earth Mineral Resources. MDL transferred the dredge from its Australian operations to begin a joint venture with Beach Minerals. There was also a notable increase in sulphate ilmenite production in China.

In South Africa, the slow build-up of slag production from the second furnace at Namakwa Sands was disrupted by a fire which is expected to reduce output for six months.

In South Australia, the Murray Basin titanium operation at Wemen, the first commercial producer in the Murray Basin, closed in early 2004.

Titanium feedstock prices remained under pressure in 2003 and early 2004, despite the improvement in pigment markets late in 2003. Persisting surplus inventories of chloride slag are the main depressing influence. The relative competitive position of producers was affected by sharp increases in ocean freight costs, and the weakness in the Australian dollar and the South African rand against the US dollar. The average US import price of Richards Bay slag fell below US\$400/t, and new contract prices were set at markedly lower levels. Synthetic rutile prices increased by about 20% in US dollar terms, however, closing the effective price gap with slag (after taking into account the different costs of pigment production).

### **New projects**

A number of new projects have advanced in their development. The enlarged BeMaX group will be able to proceed with development of the Pooncarie project in the Murray Basin. First production is scheduled for late 2005. Initial output will be 93,000 t/y of rutile and leucogene. Ilmenite will be stockpiled for processing in a subsequent development phase.

In Canada, QIT completed a feasibility study to increase production of upgraded slag (UGS) from 250,000 t/y to 325,000 t/y by 2005, and a further expansion to 425,000 t/y is envisaged.

Iluka continued evaluation of the Douglas and KWR projects in the Murray Basin. An investment decision on Douglas is expected this year, with first production in 2006. KWR is envisaged as a later add-on to Douglas. Initial production would be 54,000 t/y of rutile, increasing to 154,000 t/y.

A joint venture between Austpac and Southern Titanium is looking at developing the WIM 150 deposit in the Murray Basin, using Austpac's ERMS technology. The WIM 150 deposit was originally investigated by CRA in the early 1990s.

In Mozambique, WMC Resources is understood to be seeking a partner to develop the giant Corridor Sands project. The first phase of the project involves construction of three furnaces with a combined capacity of 375,000 t/y of slag.

In Madagascar, the Rio Tinto deposit at Fort Dauphin moved a step further. A development decision is expected in 2005. Current plans call for a project producing 750,000 t/y of ilmenite.

In India, Tata Iron and Steel completed a feasibility study for the construction of an integrated feedstock and pigment plant in Tamil Nadu.

In Russia, Aricom plc announced plans to exploit the Kuranakh ilmenite deposit in eastern Siberia, and to construct a sulphate pigment plant nearby. Aricom would be the first Western company to produce titanium dioxide in Russia.

**Natural rutile production by region ('000 t/y TiO<sub>2</sub> units)**

	2001	2002	2003
Australia	200	200	170
South Africa	120	130	100
US	30	20	20
Others (*)	30	40	40
<b>W. World Total</b>	<b>380</b>	<b>390</b>	<b>330</b>

Note: (\*) Does not include CIS.

Source: Smith Barney estimates, TZMI, Company reports, Mines Department reports.

**Ilmenite production by region ('000 t/y TiO<sub>2</sub> units)**

	2001	2002	2003
Australia	1,200	1,120	1,190
India	300	300	370
US	310	310	400
Malaysia	90	100	100
Brazil	50	60	60
<b>W. World Total</b>	<b>1,950</b>	<b>1,890</b>	<b>2,120</b>

Note: Canadian and South African ilmenite production used in slag production omitted.

Source: Smith Barney estimates, TZMI, Company reports, Mines Department reports.

<b>Synthetic rutile production by region ('000 t/y TiO<sub>2</sub> units)</b>			
	<b>2001</b>	<b>2002</b>	<b>2003</b>
Australia	610	580	620
India	70	70	80
US	180	180	90
Other	50	50	50
<b>W.World Total</b>	<b>910</b>	<b>880</b>	<b>840</b>

Source: Smith Barney estimates, TZMI, Company reports, Mines Department reports.

<b>Titanium dioxide pigment production capacity by region ('000 t/y)</b>			
	<b>2001</b>	<b>2002</b>	<b>2003</b>
Americas	1,730	1,730	1,730
W. Europe	1,440	1,470	1,480
Japan	340	340	320
Australia	180	200	200
Others	690	740	810
<b>World Total</b>	<b>4,380</b>	<b>4,480</b>	<b>4,540</b>

Sources: Smith Barney estimates, USGS, Industry Sources.

<b>Titaniferous slag production by region ('000 t/y)</b>			
	<b>2001</b>	<b>2002</b>	<b>2003</b>
Canada	790	830	710
South Africa	870	820	800
Norway	140	140	140
<b>W. World Total</b>	<b>1,800</b>	<b>1,790</b>	<b>1,650</b>

Source: Smith Barney.

<b>Titanium sponge production capacity by region (t/y)</b>			
	<b>2001</b>	<b>2002</b>	<b>2003</b>
US	8,600	8,600	8,600
Japan	30,700	30,700	30,700
China	3,000	3,000	3,000
CIS	100,000	100,000	100,000
<b>World Total</b>	<b>142,300</b>	<b>142,300</b>	<b>142,300</b>

Source: Smith Barney estimates, TZMI.