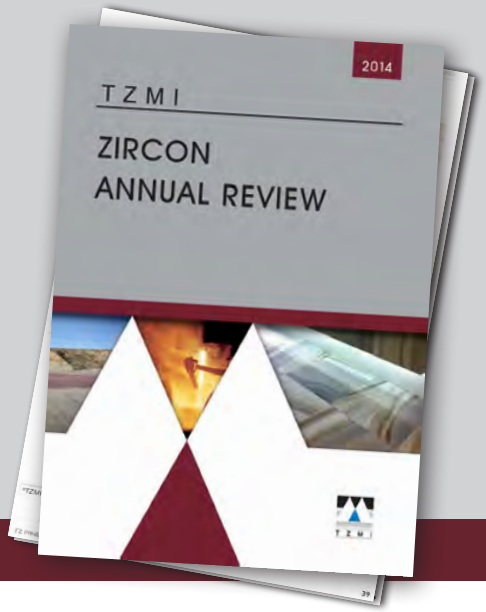

ZIRCON ANNUAL REVIEW *SAMPLE*

NEW EDITION TO BE RELEASED Q2 2014

PROPOSED TABLE OF CONTENTS*

* minor changes may be made to this outline prior to publication

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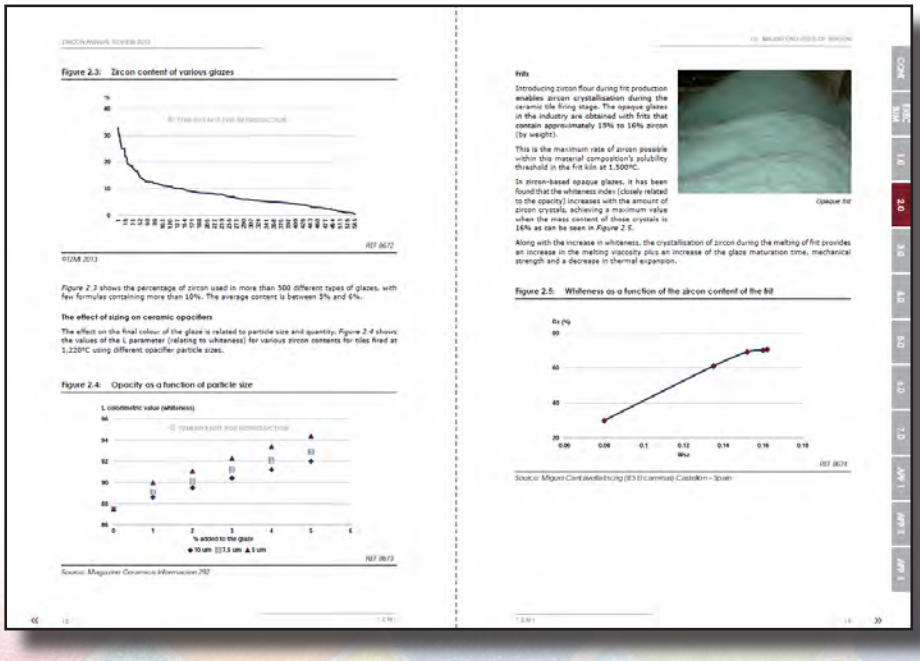
SAMPLE OF 2013 EDITION

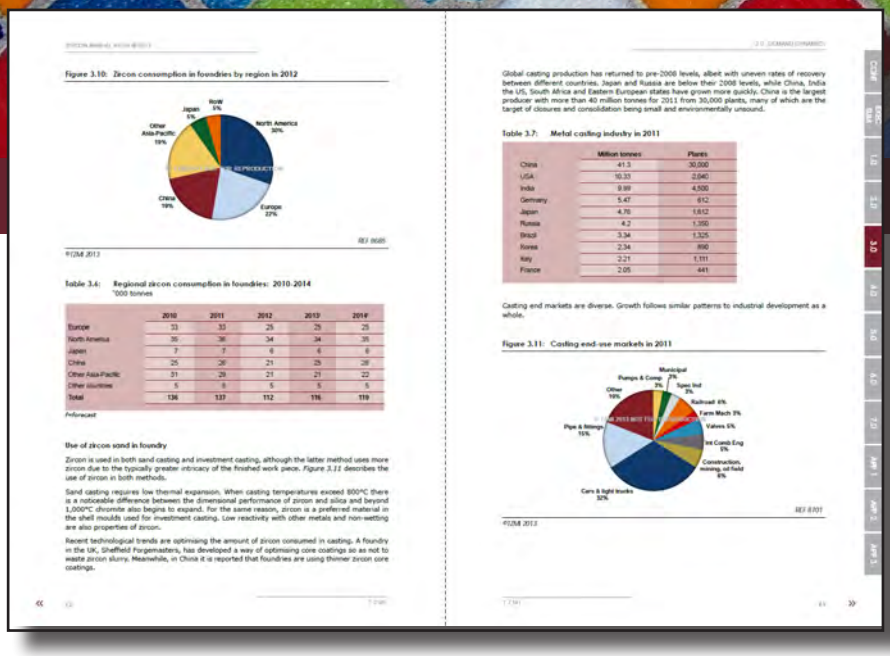
NEW EDITION TO BE RELEASED Q2 2014

THE ZIRCON MARKET AND MAJOR END-USES

Comprehensive analysis of the major end-uses for zircon



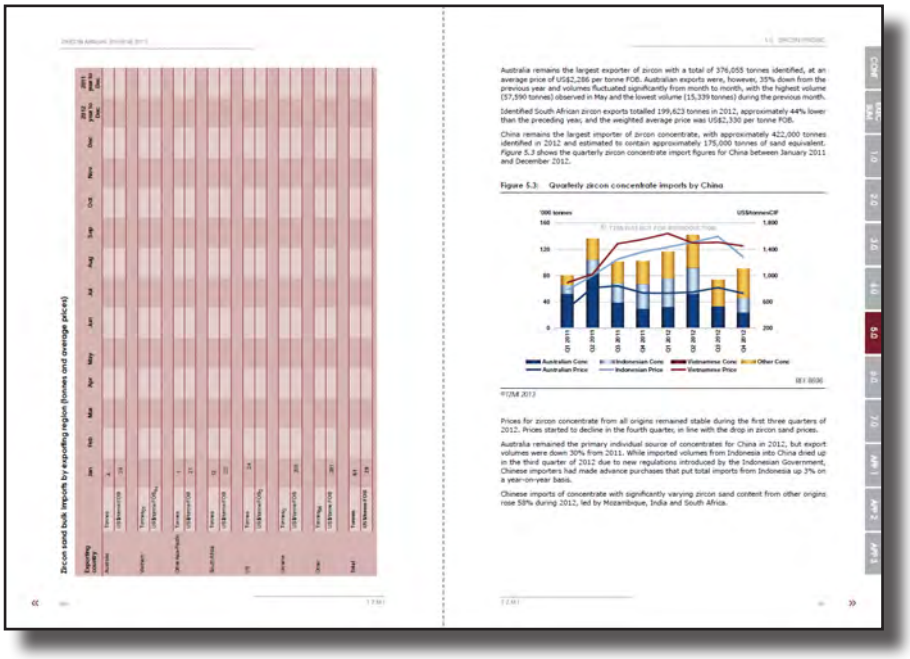
Sections for each end-use with an examination of demand drivers



DEMAND DYNAMICS

Demand broken down by regions, drivers, growth in end-uses.

SUPPLY AND PRICING



Examines supply developments in the past year.

Pricing information targets trends by producer and region.

> "Regionally, Australia remains the largest zircon producing country, accounting for 36% of global production in 2012."

Trade analysis across the globe

China's influence on the zircon market

Export trade analysis by country

NEW PROJECTS

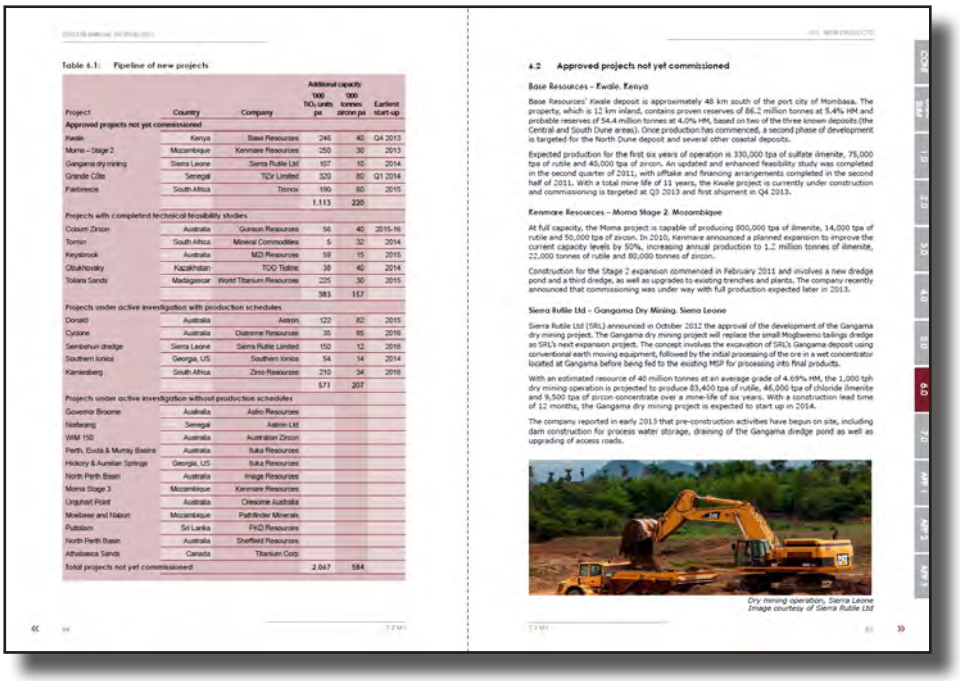


Table 6.1: Pipeline of new projects

Project	Country	Company	Additional capacity '000 TiO2 units pa	'000 tonnes zircon pa	Earliest start-up
Approved projects not yet commissioned					
Kwale	Kenya	Base Resources	246	40	Q4 2013
Moma – Stage 2	Mozambique	Kenmare Resources	250	30	2013
Gangama dry mining	Sierra Leone	Sierra Rutile Ltd	107	10	2014
Grande Côte	Senegal	TiZir Limited	320	80	Q1 2014
Fairbreeze	South Africa	Tronox	190	80	2015
			1,113	220	
Projects with completed technical feasibility studies					
Coburn Zircon	Australia	Guinson Resources	56	40	2015-16
Tormin	South Africa	Mineral Commodities	5	32	2014
Keysbrook	Australia	MZI Resources	59	15	2015
Obukhovskiy	Kazakhstan	TOO Tiotine	38	40	2014
Toliara Sands	Madagascar	World Titanium Resources	225	30	2015
			383	157	
Projects under active investigation with production schedules					
Donald	Australia	Astron	122	82	2015
Cyclone	Australia	Diatreme Resources	35	65	2016
Sembehun dredge	Sierra Leone	Sierra Rutile Limited	150	12	2016
Southern Ionics	Georgia, US	Southern Ionics	54	14	2014
Kamiesberg	South Africa	Zinco Resources	210	34	2016
			571	207	
Projects under active investigation without production schedules					
Governor Broome	Australia	Astro Resources			
Niafarang	Senegal	Astron Ltd			
WIM 150	Australia	Australian Zircon			
Perth, Eucla & Murray Basins	Australia	Iluka Resources			
Hickory & Aurelian Springs	Georgia, US	Iluka Resources			
North Perth Basin	Australia	Image Resources			
Moma Stage 3	Mozambique	Kenmare Resources			
Urquhart Point	Australia	Oresome Australia			
Moebase and Nabun	Mozambique	Pathfinder Minerals			
Puttalam	Sri Lanka	PMD Resources			
North Perth Basin	Australia	Sheffield Resources			
Athabasca Sands	Canada	Titanium Corp			
Total projects not yet commissioned			2,067	584	

6.2 Approved projects not yet commissioned

Base Resources – Kwale, Kenya

Base Resources' Kwale deposit is approximately 40 km south of the port city of Mombasa. The property, which is 12 km inland, contains proven reserves of 86.2 million tonnes at 5.4% HM and probable reserves of 54.4 million tonnes at 4.0% HM, based on two of the three known deposits (the Central and South Dune areas). Once production has commenced, a second phase of development is targeted for the North Dune deposit and several other coastal deposits.

Expected production for the first six years of operation is 330,000 tpa of sulfate ilmenite, 75,000 tpa of rutile and 40,000 tpa of zircon. An updated and enhanced feasibility study was completed in the second quarter of 2011, with offtake and financing arrangements completed in the second half of 2011. With a total mine life of 11 years, the Kwale project is currently under construction and commissioning is targeted at Q3 2013 and first shipment in Q4 2013.

Kenmare Resources – Moma Stage 2, Mozambique

At full capacity, the Moma project is capable of producing 800,000 tpa of ilmenite, 14,000 tpa of rutile and 50,000 tpa of zircon. In 2010, Kenmare announced a planned expansion to improve the current capacity levels by 50%, increasing annual production to 1.2 million tonnes of ilmenite, 22,000 tonnes of rutile and 80,000 tonnes of zircon.

Construction for the Stage 2 expansion commenced in February 2011 and involves a new dredge pond and a third dredge, as well as upgrades to existing trenches and plants. The company recently announced that commissioning was under way with full production expected later in 2013.

Sierra Rutile Ltd – Gangama Dry Mining, Sierra Leone

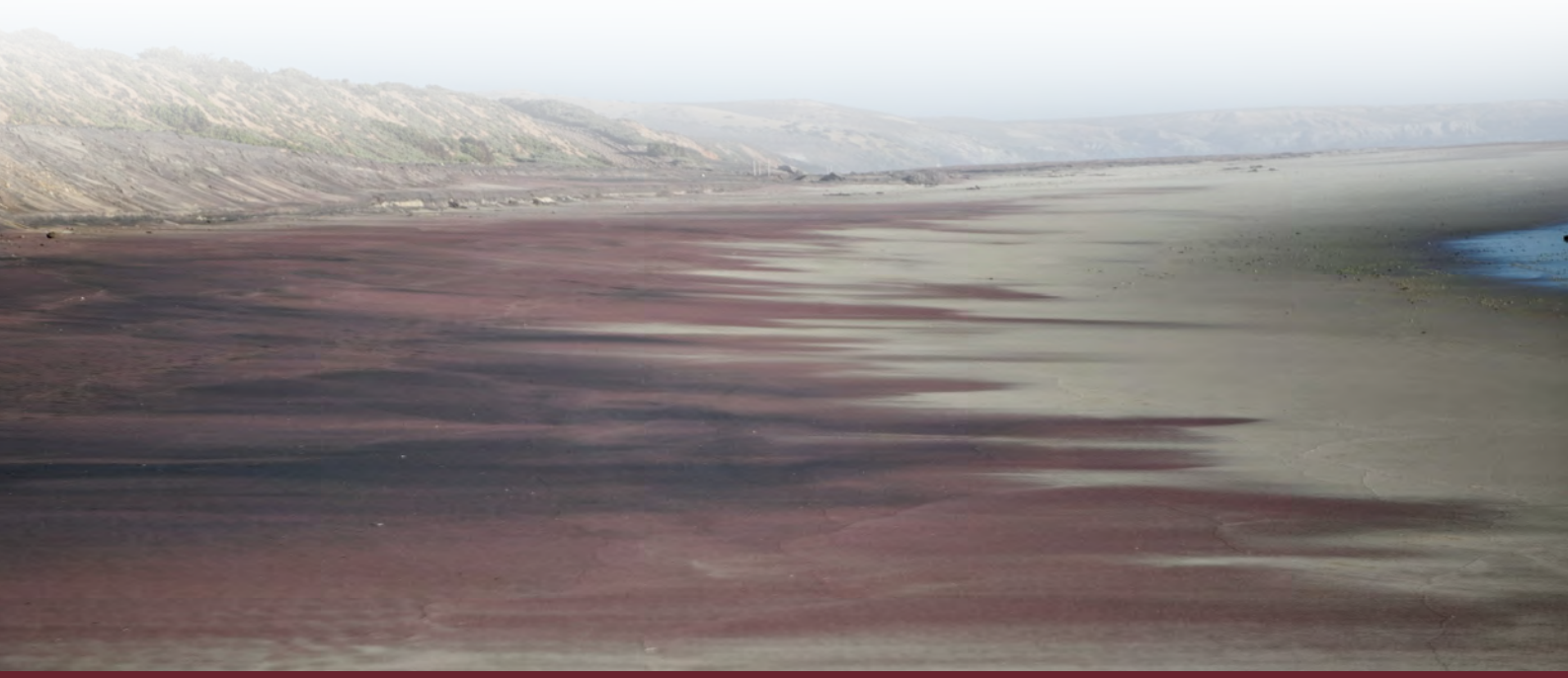
Sierra Rutile Ltd (SRL) announced in October 2012 the approval of the development of the Gangama dry mining project. The Gangama dry mining project will replace the small Mogbwemo tailings dredge as SRL's next expansion project. The concept involves the excavation of SRL's Gangama deposit using conventional earth moving equipment, followed by the initial processing of the ore in a wet concentrator located at Gangama before being fed to the existing MSP for processing into final products.

With an estimated resource of 40 million tonnes at an average grade of 4.69% HM, the 1,000 tph dry mining operation is projected to produce 83,400 tpa of rutile, 46,000 tpa of chloride ilmenite and 9,500 tpa of zircon concentrate over a mine-life of six years. With a construction lead time of 12 months, the Gangama dry mining project is expected to start up in 2014.

The company reported in early 2013 that pre-construction activities have begun on site, including dam construction for process water storage, draining of the Gangama dredge pond as well as upgrading of access roads.

Dry mining operation, Sierra Leone
Image courtesy of Sierra Rutile Ltd

This section includes a synopsis of projects in the pipeline. It also includes an outline of each project and its development status.



STRATEGIC ISSUES

Key challenges in the zircon sector

A discussion of thrifting & substitution and the impact on the zircon market

Future issues for the industry

APPENDIX 1 *Producer profiles*

APPENDIX 2 *Consumer profiles*

APPENDIX 3 *New projects profiles*

SAMPLE PROFILE

Richards Bay Minerals

Ownership	Rio Tinto, RBM's managing company, owns 74% of RBM's shares. Blue Horizon, a B-BBEE consortium holds 24% and 2% is held in a trust for employees.
Address	PO Box 401 Richards Bay 3900 SOUTH AFRICA **Tel:** +27 35 901 3111 **Website:** www.rbm.co.za **Email:** communication@rbm.co.za
Key personnel	Jean-François Turgeon – Acting Managing Director Denis Booysen – General Manager, Engineering Fundi Dlamini – General Manager, Communities and Corporate Relations Bheki Gumbi – General Manager, Human Resources Joey Kunji-Behari – General Manager, Smelting and Processing Johan Jacobs – General Manager, Technical
Background	In 1971, the Industrial Development Corporation began a detailed investigation of the Richards Bay area. A Canadian producer of titania slag (QIT) was also looking for major ilmenite deposits in 1974. These two organisations, together with Union Corporation (later Gencor now BHP Billiton), formed RBM in 1976 to mine and beneficiate the vast mineral-rich sands in the coastal dunes that extend 17 km in a two kilometre wide strip from just north of Richards Bay. In 1985 the company acquired the mining rights to additional ore reserves both north and south of the original deposit. During 2001, RBM started dry mining operations to supplement its dredge mining operations. Legislation passed by the South African Government in 2004 requires that mining companies sell 26% of their mines to black investors by 2014. The company announced in December 2008 that a definitive agreement with a Broad Based Black Economic Empowerment (BBBEE) consortium, Blue Horizon, had been signed. In December 2009, the rand 4.5 billion (US$55.4 million) deal was completed. Blue Horizon acquired a 24% equity interest in RBM, with 2% of the equity held by permanent employees through an employee participation scheme. It is the largest broad-based black economic empowerment deal in the region to date. In July 2008, the company announced that it had approved more than rand 1 billion (US$147.2 million) in funding for a new MSP tailings treatment plant project. The project is expected to extend mine life by a further five years. RBM also announced plans to generate sufficient electricity in-house to be able to supply a portion of the power plants requirements; approximately 6.5 MW by 2011. Following the completion of the BBBEE deal, Richards Bay Minerals (RBM) consists of two separate operating companies; Richards Bay Mining (Pty) Ltd, which is responsible for mining operations; and Richards Bay Titanium (Pty) Ltd, which is responsible for the smelting and beneficiation process In April 2009, Rio Tinto removed one of the four furnaces at Richards Bay from operation for a period of five months for a planned rebuild. >>

Richards Bay Minerals

Operations	<< RBM mines dunal sand deposits in KwaZulu-Natal, South Africa, stretching from 10 to 50 km north of Richards Bay. Four separate mining plants provide a combined mining capacity of approximately 115 million tpa. The most recent mining plant consists of two dredges and one concentrator, and was commissioned at the end of 1999. It was designed to compensate for falling ore grades. Auxiliary dry mining is also employed at RBM, and now contributes an estimated 15% of the total volume of ore mined. Much of the dry mined ore is sourced from areas inaccessible to the dredges used as the principal mining method. Mineral concentrate is trucked to a central processing plant where ilmenite is extracted by magnetic separation and the non-magnetics are further processed for the recovery of zircon and rutile. The mineral processing plant currently has capacity to produce up to 240,000 tpa of zircon and 90,000 tpa of rutile. Up to 160,000 tpa of zircon are acid leached to produce a 'premium' grade zircon. In its current leases to the north of Richards Bay, and in an additional lease south of Richards Bay, it is understood that RBM has reserves sufficient for more than 20 years operation at current mining rates. Present measured reserves (expressed in terms of slag product) stand at 24.9 million tonnes, with a further 3.0 indicated and inferred million tonnes categorised as resources. RBM announced in March 2011 that it intended to mine its Zulti South mining lease area, south of Richards Bay, extending mining operations to around 2043. Mining of the area could start as early as 2016. In March 2011, the company commissioned its tailings treatment plant and began production in April 2011. RBM plans to treat 2.2 million tonnes of tailings per year.
Recent developments	In February 2012, BHP Billiton Ltd agreed to sell its 37% stake in RBM to Rio Tinto. In February 2013, Rio Tinto announced that it was taking action at a number of its operations and would place its zircon and rutile processing operations at RBM on care and maintenance, while maintaining production at the core ilmenite mining and smelting operations. The decision followed the announcement of Rio Tinto's annual results for 2012. Rio Tinto reported a US$3 billion loss for the 2012 year, citing a US$14.4 billion write down relating to aluminium businesses and coal assets in Mozambique.

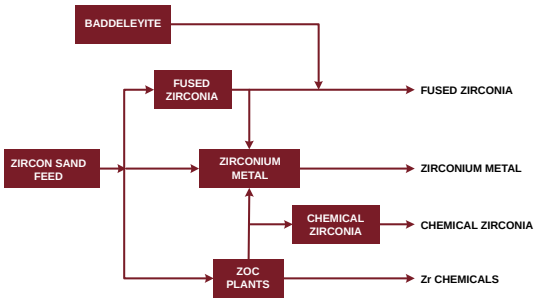
SAMPLE PAGES

Includes 99 pages, plus 80 company **profiles**

62 easy-to-read charts, images and detailed tables

electronic version (PDF) with easy-to-navigate buttons

Structure of the zirconia, zirconium chemicals and metal industries



Zircon is used in the sanitaryware industry to provide opacity and whiteness. Zircon only forms part of the sanitaryware glaze and rarely is in the ceramic structure of the sanitaryware body. The typical content of zircon in a sanitaryware glaze is between 15-16%.

Specialty chemicals and materials

Zirconium chemicals comprise a varied group, each member containing zirconium as an active constituent. The most common intermediate product, from which many of the others are manufactured, is zirconium oxychloride octohydrate or ZOC, which has the formula, $ZrOCl_2.8H_2O$.

Another often-used intermediate is zirconium basic sulfate, known as ZBS.

While they have significantly different end-uses, the two general types of zirconia - fused and chemical - share a range of characteristics which make them valuable materials in various specialist applications. The principal differences between the two types of zirconia are:

- Chemical zirconia is considerably purer than fused zirconia, so it tends to be used in the applications which require greater precision of performance;
- The surface area to weight ratio of the crystals of chemical zirconia is far higher.

Refractories and foundries

Zircon has a high melting point and high resistance to thermal shock, making it a suitable candidate for use as a refractory in high-temperature applications. Zirconia, exhibits very similar refractory properties to zircon, except that it has a higher melting point and can be used in applications where temperatures exceed 1,990°C.

The main advantage of zircon as a foundry sand is its refractoriness and resistance to metal penetration as well as its ability to withstand high temperatures for long periods. This allows zircon to be used in foundries for the casting of high-alloy stainless steels, at temperatures as high as 1,650°C.

The combination of these characteristics (refractoriness, low thermal expansion and chemical stability), make zircon an ideal non-silica foundry sand. High prices however, mean it is used only in high-end castings and specialised applications.

Zircon supply

Global zircon supply grew by 23% in 2010 from 2009 levels, reaching 1.3 million tonnes and reached 1.6 million tonnes in 2011 amid escalating prices. The price of zircon sand experienced a sharp correction during 2012. Prolonged economic malaise in Europe and overstocking in China were cited as the primary causes, as well as the perennial price increases with which customers on both continents had to contend.

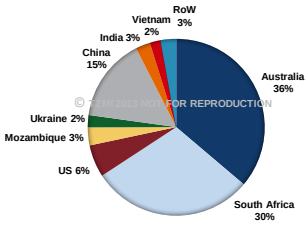
In light of the worsened market conditions, 2012 witnessed no new projects and the reduction of output and mothballing of several others. Investment continues, however, and additional supply in 2014, 2015 and 2016 can be expected.

Regionally, Australia remains the largest zircon producing country, accounting for approximately 36% of global zircon output. The following figure shows the distribution of zircon production by country in 2012.

South Africa is the second largest zircon producing country, accounting for 30% of global production in 2012. China is also fast becoming a key zircon producing country. Accounting for 15% of global output, China's zircon demand is now the largest in the world as imports 80% of its zircon.

Iluka remains the largest single producer of zircon, accounting for around 30% of global zircon output since 2001 or around 300,000 tonnes. Richards Bay Minerals is the next largest zircon producer, with estimated annual output of 270,000 tonnes in 2012, followed by China with 205,000 tonnes.

Distribution of global zircon production by country in 2012



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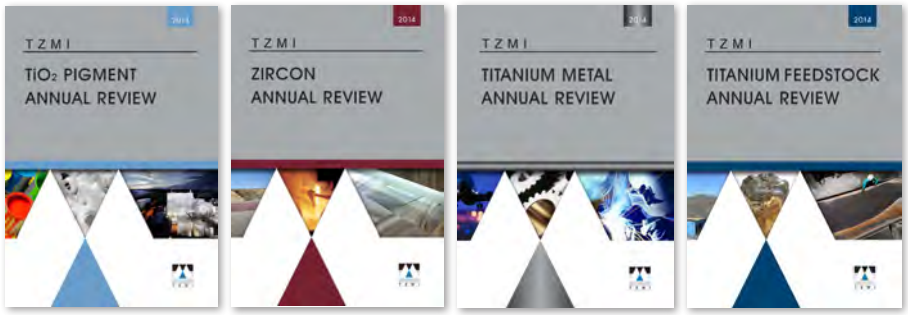

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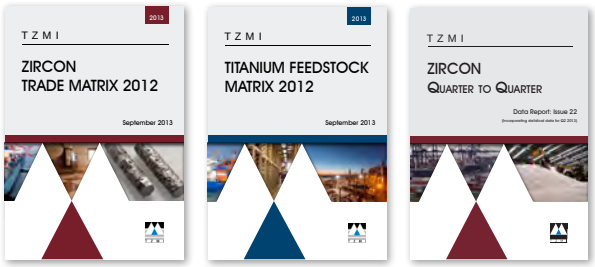

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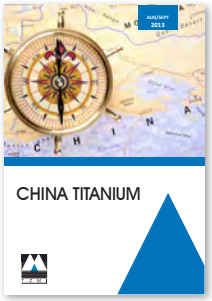

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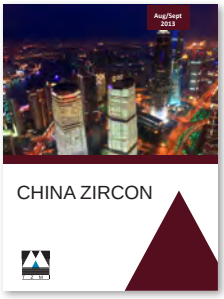

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