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China's Role in Refractory Raw Materials in the World

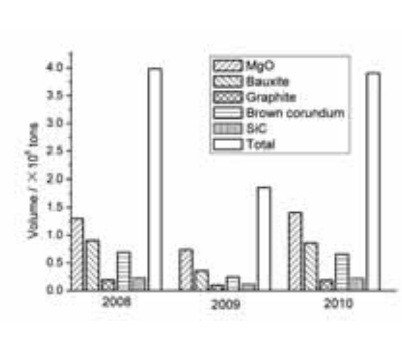

Fig. 1 Volumes of the top five refractory raw materials and the total volume of refractory raw materials exported from China in the period 2008 – 2010

Fig. 2 Dr.-Ing. Joachim Alfred Wünning (l.) and Dr.-Ing. Joachim Georg Wünning, Managing Directors of WS Wärmeprozesstechnik GmbH/DE

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Over the past three decades, the mining output of refractory raw materials has been quite large compared to the reserves in China. 8 % of the total bauxite mined and 50 % of magnesia in the world are produced in China. In addition, the volume of graphite exports in year 2010 was 0,189 mill. t. Fig. 1 shows the volumes of the top five refractory raw materials and the total volume of refractory raw materials exported from China in the past three years. Tab. 1 lists the top eight export countries for refractory raw materials in the world over the past three years. It has been reported that 90 % magnesia in Europe was imported from China. Today, many segments of the world's refractory industry depend on Chinese raw materials. Any company involved in the purchase or supply of raw materials is undoubtedly affected by the changes in Chinese refractory mineral commodities.

Current situation of refractory raw materials in China

It has been reported that the total proven reserve of bauxite is about 2,5 billion t, 2,5 % of the total deposits in the world. The proven reserve of magnesite is about 3,4 billion t, which is 25 % of the world total. For flake graphite, Chinese reserves account for 50 %. However, the per capita amount of the mineral resources is lower than the world average. For example, the per capita amount of bauxite is only 7,3 % of the world average. In addition, with the fast development of high-temperature industries in the past 20 years, especially the iron and steel industry in China, the refractory industry has developed at breakneck speed, not only in terms of output, but also in the improvement of technologies and quality of products. At present, as a result of this rapid development, the shortage of excellent natural refractory raw material resources has become a bottleneck problem. Another cause of the problem is that some refractory raw materials can be used in other industries, for example, bauxite in needed in the aluminium industry. The output of primary aluminium was 13 Mt in 2009, requiring the consumption of 57 Mt bauxite. Consequently, the shortage of some resources has been exacerbated by these other uses.
The uncontrolled, inefficient mining and consumption of refractory raw materials have caused a mul-

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IREFCON 2012 expects 500 attendees:

IRMA (Indian Refractory Makers Association) will hold the 9th Indian International Refractories Congress *IREFCON 2012* on *01.02.–04.02.2012* in Kolkata/IN. The congress theme is: **„Value Creation Through Refractories".**

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Tab. 1 Exported volume of the top eight exported countries in refractory raw materials in 2008-2010

	2008		2009		2010	
Country	**Volume [x10³ t]**	**Value [x10³ USD]**	**Volume [x10³ t]**	**Value [x10³ USD]**	**Volume [x10³ t]**	**Value [x10³ USD]**
China	3895	1703030	1939	805900	3908	1893620
USA	1581	334420	1113	226480	1467	352040
Netherlands	636	325950	383	188680	573	342970
Germany	267	252490	194	175940	256	248730
Ukraine	4859	215640	2022	97390	3642	169940
Japan	33	98030	26	87710	37	137940
Belgium	202	142040	149	98390	203	136340
Russia	335	109160	164	73650	359	116220

titude of serious problems in the long term. And the rapid development of mining has also caused serious environmental problems. Because mining/extraction is in some cases currently carried out without formal supervision or without proper technical support, probable substantial reserve areas can't be rationally planned and then mined, the degree of utilization of natural refractory resources is quite low and it is difficult to maintain a consistent quality. In most cases, Chinese refractory raw materials cannot be identified as high-grade raw materials with specific physical or chemical properties, nor can they be described as particularly different from other principal world resources, so far the price has been the primary inducement.

In China, the extraction of raw refractory resources has been included in the list of high energy-consuming and high-emission industries. In future, mining and extraction will be strictly controlled. Moreover, as a response to the shortage of mineral resources and the need for stricter environmental protection, the reform of the primary resource tax has been discussed and will be implemented soon. At present, numerous strategic export restrictions for raw materials and the increasing need for raw materials are exacerbating the already tense situation with the scarcity of materials. It is forecast that the costs of refractory raw materials will increase to some degree in the future.

Therefore, from now on, many more strategic measures should be considered to ensure the sustainable development of China's refractory industry. Advanced technical support for planning and implementing an efficient mining programme must be provided. The efficient exploitation and utilization of refractory raw materials have become more urgent. In addition, refractory raw materials enterprises in China should accelerate steps to install more advanced and efficient equipment and systems in mining and processing procedures instead of sticking to their relatively rudimentary operations. Rational mining and beneficiation of low-grade refractory raw materials have become more important with regard to ensuring consistent high quality.

Extract from the paper **"Development of the Refractory Industry in China with Restrictions of Resources, Energy and Environment Factors"** presented at UNITECR 2011 by *Li Hongxia, Sinosteel Luoyang Institute of Refractories Research Co., Ltd.*

The full version will be published in volume 4 (2012)

news flash

Germany

German Environmental Award 2011 for WS Wärmeprozesstechnik

On the 30th October 2011 German President *Christian Wulff* handed over Europe's most lucrative environmental award to *Dr Joachim Alfred Wünning* and *Dr Joachim Georg Wünning*, Managing Directors of the Renningen based *WS Wärmeprozesstechnik GmbH* (see page 1).

With the award the *Deutsche Bundesstiftung Umwelt* honoured a committed, innovative medium-sized *VDMA (German Engineering Federation)* member company of the specialist *Thermo Process Technology Association* for the development of an environmentally friendly burner technology. The FLOX process developed by the father-and-son team is a special technology for industrial burners. FLOX stands for „flameless oxidation". If applied in industrial manufacturing processes the new technology provides energy savings ranging from 20–50 % compared to traditional processes. The level of nitrogen-oxides that is formed in high-temperature processes can be considerably reduced. The successful introduction of FLOX on international markets demonstrates the practical applicability of the technology. Ecology and economy go hand in hand with FLOX as expensive exhaust gas cleaning sytems are no longer needed and less fuel is consumed. The technology reduces health risks and negative effects on the environment caused by emissions.

As a longstanding member of the Thermo Process Technology specialist association of VDMA, the company has been actively involved in the network committing itself to energy efficient and environmental friendly production processes. WS actively participated in the drafting of the Energy Efficiency Manual for Thermo Processing Plants released by the association and is a committed member of the *Research Association of Industrial Furnace Manufacturers (FOGI)* that coordinates pre-competitive research activities of the sector. Nearly 40 % of the energy consumed by German industry is for industrial furnaces. That is why the member companies of the Thermo Process Technology specialist association have been long engaged in promoting further development of thermo processing technologies that tap resource flows effectively and keep emissions down. The use of recuperators, regenerators and improved thermal processes contributes to achieving these goals. Modern plants in the sectors of steel and glass production as well as in chemical or petrochemical industries or in automotive manufacturing provide energy savings up to one third compared with older plants.

China

Beroa Group's First Step in China

CRI, company of the *Beroa Group*/SA, got more than USD 10,5 million contract in China for refractory lining of 8 jumbo Catofin reactors in *Tianjin Bohua Propylene Plant*. The contract includes engineering, project management and installation supervision, refractory material procurement and supply. Engineering started in June 2011, completion is forecast ending 2012, and dry out for April 2013.

Brazil

Acquisition of Vale's Aluminium Business

On 28 February 2011 *Hydro*/NO completed the takeover of the majority of *Vale*'s aluminium business in Brazil. Effective from the first quarter of 2011, the group included a new operating segment, bauxite and alumina, in its reporting structure in addition to ist other five operating segments.

In addition to the assets acquired from Vale, Hydro's bauxite and alumina activities previously included in the primary metal segment have been transferred to the new bauxite and alumina segment and prior periods have been restated. Primary metal includes the Albras aluminium plant in addition to Hydro's pre-transaction primary aluminium production activities. Effective from the first quarter of 2011, elimination

of internal gains and losses on alumina previously included in the primary metal segment is included in other and eliminations, and prior periods have been restated.

Germany

Almatis Announced Price Increases

Effective 1 October 2011, *Almatis* raised prices on its entire specialty alumina product portfolio including all standard products in tabular alumina, calcined alumina, calcium aluminate cement and spinels. Price increases range from 8 to 12 % and are effective for all new contracts. After the strong recovery from the recession, more capacity for higher quality products is essential. The specialty alumina industry needs a healthier margin level to allow for further investment and to guarantee a reliable supply of premium products and stronger innovation to support the end markets in their future growth.

Brazil

Putzmeister Brazil Moves to Larger Facility

Putzmeister Brazil, Ltda. (PMB), a subsidiary of Putzmeister America, Inc., has moved to a new, larger facility due to increased production needs for the sales and service of the complete range of Putzmeister, Allentown shotcrete technology and Esser pipe technology equipment in Brazil.

The new facility for PMB is located in Atibaia, just outside of Sao Paulo; *Roberto Schaefer* is PMB's Managing Director and COO. Meeting the demands of Brazil's growing economy, the new facility offers more storage, a paint booth and a testing area for various equipment. The new environmentally conscious facility features a concrete pump test pad with a water recovery and recycle system. The system separates oil from the water used to test the pump, for safe water disposal, minimizing the impact on local water resources. PMB also provides new equipment, spare parts inventory, after sales support and a facility for operator and maintenance training, as well as refurbishment services of customer-owned equipment.

Austria

RHI Begins Construction of First Plant in Brazil

RHI AG, the global refractory products leader for the steel, cement and glass sectors, has begun to build its first factory in Brazil, located in the Industrial District of Queimados, part of the Rio de Janeiro metropolitan region. Investment for its first phase will be EUR 85 million and the factory will create 200 direct and about 400 indirect jobs. The start of production is planned for the third quarter of 2013, the plant will occupy 120 000 m^2. It is expected that the new plant's annual production will be 60 000 t. Of this total, more than half will be for the domestic market and the rest shipped throughout Latin America. In 2010, 7 % of Group sales were in South America and the intention is to increase this percentage significantly. The company also plans to expand its capacities in a second phase, also creating more jobs. Currently RHI employs around 101 people in a strong sales team that operates in Belo Horizonte.

Germany

SGL Builts New Graphite Production Center at Bonn Site

SGL Group, headquartered in Wiesbaden/DE, started the construction of green production of isostatic graphite at their Bonn location, which will triple their capacity to 15 000 t/a of isostatically pressed graphite. The Bonn location of SGL Group witnessed the groundbreaking ceremony for the construction of a new production center for the manufacture of isostatic graphite.

Construction started in September while work on the production facility will be completed by the end of 2012. *Dr Gerd Wingefeld*, Member of the Executive Board of SGL Group said: "The investment in the new production center for isographite is a pledge to the Bonn site, which we will continue to develop into a high technology location. As part of our multiyear investment programme, we will triple our production capacity around the world and thereby consolidate our leading global position in this growth market."

Over the next two years, Bonn will see the construction of a new 3500 m^2 production center for isostatic graphite. The plant will incorporate milling and mixing facilities and, as a centerpiece, a large press with a weight of 800 t. In addition to state-of-the-art technology, the planning for this major investment also includes the process technology developed over decades at the Bonn location. The new, cutting-edge green production project will enable SGL Group to meet growing customer demand for large moulded isostatic graphite components.

As a result, SGL Group's capacity for isostatic graphite will therefore be increased from 5000 to 15 000 t/a worldwide in the coming years. The specific investment in the Bonn location is part of an extensive programme of investment along the global value chain for isostatic graphite. SGL Group will invest around EUR 75 million in expanding its capacity and ongoing technological development by 2012.

In addition to increasing production in Bonn, the programme also includes investments in the Chinese locations of Yangquan (baking and graphitizing) and Shanghai (machining, purification and coating). This is in line with SGL Group's strategy to supply local growth markets such as those in Asia – mainly China, Taiwan, South Korea, and Japan – from their own local production sites. SGL Group continues to further expand its strong global technology position in these rapidly growing markets. Isostatic graphite is essential, for the production of ultra-pure polysilicon and silicon monocrystals for the semiconductor and photovoltaic industries. Graphite components are also needed in the manufacture of LEDs. SGL Group is one of the world's leading manufacturers of carbon-based products. It has a comprehensive portfolio ranging from carbon and graphite products to carbon fibres and composites.

With 45 production sites in Europe, North America and Asia as well as a service network covering more than 100 countries, SGL Group is a company with a global presence. In 2010, the Group's workforce of around 6300 generated sales of EUR 1382 million.

Austria

RHI Buys Irish Raw Materials Producer

RHI signed a contract to acquire *Premier Periclase Ltd. (PPL)*, Ireland. The purchasing price amounts to EUR 21 million. PPL is one of the worldwide suppliers of seawater-based large crystal sinter and, with 110 employees, produces roughly 70 kt of sintered magnesia annually in the north of Dublin. In addition, the closing of the acquisition of *SMA Mineral Magnesia AS*/NO, took also place. With the capacity expansion in Turkey and the acquisition of SMA and PPL RHI is going to increase its self-sufficiency in magnesia raw materials up to approx. 80 % by mid-2012.

Germany

Energy Efficiency in the Spotlight at CERAMITEC 2012

Nowadays, evaluating energy efficiency is about more than purely analysing the efficiency of the thermal processes involved in ceramic production. By the same token, in addition to the effective use of thermal energy, electrical and pneumatic con-

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news flash

sumption values are reduced by constantly optimising the process chain. These are measures the primary objective of which is to use less energy but with the secondary objective, for example, of using waste heat even more rigorously by closing consumption cycles. In addition to production efficiency, reliability and investment amount, reducing whole life plant operating costs for energy, water and raw materials has become a major decision-making criterion in selecting new machinery and ovens. Environmentally sensitive and cost efficient production is a critical competitive factor in being able to survive in the marketplace and safeguarding production locations.

When it comes to ceramic production, water and raw materials management are just as important as the efficient use of energy. Basically, what this again comes down to is closing material handling cycles and avoiding waste and/or waste water. Secondary raw materials use has now become a relevant issue not just for primary raw materials, which are becoming scarcer. One of ceramic raw materials' strengths is that they can also be reused in the slaked, pre-reactive state. This applies not just with regard to its recirculation within the process itself but also after it has been used. All that remains is to find solutions for how to make the reprocessing of ceramic products economically viable. There are now pilot projects in a number of ceramics areas. Ultimately it is not about minimising waste but avoiding it entirely, and with minimal use of energy into the bargain. This requires an end-to-end approach from raw materials' selection, for example avoiding toxic substances, to recycling the end product. This may necessitate specific new developments as regards the manufacturing processes but also in the product design. The processes' sustainability concept needs to be thought through to the next level, in order for example to comply with current energy efficiency and environmentally friendly building trends.

The "Green Buildings" banner refers to the approach of reducing the buildings' overall energy requirement and achieving the lowest possible CO_2 emissions. In addition to building materials that are made in an energy-efficient way, this also requires an ecological product design to match, such as lightweight bricks. Nowadays, the brick manufacturers' customer service also includes energy advice in designing a building. In this respect, energy efficiency is not just an issue in the manufacturing process itself but also when using products in the course of building or, putting it more generally, in the "system". Energy efficiency and the avoidance of CO_2 emissions are basic measures in refining the "green" manufacturing process. A complementary measures component is also required for sustainable development if the path that leads to "Green Manufacturing" or to "Green Products" is to be successfully trodden. This requires an interactive dialog between ceramics manufacturers and their suppliers. As an international presentation and communication forum, CERAMITEC 2012 provides the ceramics industry with the best opportunity for successfully developing this dialog. Further information available at CERAMITEC 2012 at www.ceramitec.de .

Austria

RHI: Change in the Management Board

Henning E. Jensen informed the Supervisory Board of RHI AG that he will resign, with immediate effect, from his function as the CEO of *RHI AG* on his own request. The Supervisory Board of RHI AG accepted his resignation and appointed *Franz Struzl* new Chairman of the Management Board with effect from 8 September 2011. Franz Struzl, 69, was a member of the Management Board of the *Voestalpine Group* for 12 years, of which he held the position of the CEO for the last three years. Most recently Franz Struzl managed *Villares Metals*, Brazil, a company of the *Böhler-Uddeholm Group*.

Norway

Hydro Third Quarter 2011 Results

Hydro had underlying earnings before financial items and tax (EBIT) of NOK 1,646 million in the third quarter, down from NOK 1,906 million in the second quarter. The quarter was marked by higher production performance in bauxite and alumina, while seasonal declines and higher raw material costs had a negative impact on underlying results. Energy posted record third-quarter results. Bauxite and alumina are showing solid results, with Paragominas and Alunorte reporting increased quarterly production. The company is strengthening its focus on the ongoing ambitious cost improvement programs.

Underlying EBIT for bauxite and alumina increased compared to the second quarter primarily due to improved production performance and better results for commercial activities. Underlying EBIT for primary metal declined compared to the second quarter due to lower sales volumes and higher raw material costs, partly offset by higher realized aluminium prices.

Ramp-up of production at *Qatalum*, the 50/50 joint venture between *Qatar Petroleum* and Hydro, was completed and the plant reached full capacity contributing to increased production for the quarter. Global demand for alumina outside China was slightly higher in the third quarter compared to the second quarter mainly due to the ramp-up of new production capacity. Annualized alumina production outside China amounted to about 54 Mt. Alumina demand and production in China continued to increase in the third quarter compared to the previous quarter, mainly due to commissioning of new primary aluminium production and alumina projects.