refractories
Hot Topics WORLDFORUM
Manufacturing & Performance of High-Temperature Materials
NEWSLETTER 1/2016

IMPORTANT DATES

29.03.2016 - 31.03.2016
ACerS St. Louis Section and Refractory Ceramics Division Joint Meeting
St. Louis / US
www.ceramic.org/meetings/acers-meeting

29.03.2016 - 31.03.2016
CIPPE: 16th China International Petroleum and Petrochemical Technology and Equipment Exhibition
Beijing / CN
www.cippe.com.cn/2016/en

04.04.2016 - 07.04.2016
Industrial Minerals International Congress and Exhibition
Istanbul / TR
www.indmin.com/events

11.04.2016 - 13.04.2016
IMFORMED – Mineral Logistics Forum 2016
Rotterdam / NL
www.imformed.com

12.04.2016 - 14.04.2016
IX. International Conference: Refractories, Furnaces and Thermal Insulation
High Tatras / SK
www.konferencie.net

13.04.2016 - 15.04.2016
MagMin 2016
Dusseldorf / DE
www.indmin.com/magmin

26.04.2016 - 28.04.2016
2nd Ceramics Expo
Cleveland / US
www.ceramicsexpousa.com

09.05.2016 - 11.05.2016
MagForum 2016
Vienna / AT
www.imformed.com

FIRE: Refractories Initiative for the Reduction of Emissions – SPP 1418

The research programme „ Refractories Initiative for the Reduction of Emissions – SPP 1418 (FIRE) was started in 2009. Researchers from twelve German universities and research institutions have joined the Priority Programme, established to develop novel refractory materials and components. The interdisciplinary collaboration between these members enhanced the creation of fundamental knowledge about innovative refractories. It was funded by the German Research Foundation (DFG) from 2009 to 2015 in recognition of the importance of refractory materials.

The programme concentrated on interdisciplinary research for carbon containing refractories. These materials exhibit an excellent thermal shock resistance, which explains their importance in steel production. On the one hand, the activities focused on the optimization of the properties of these refractories as well as on the more efficient use of raw materials and resources.
On the other hand, the project aimed at reducing the carbon content in the refractories because of the high carbon dioxide emissions especially during the production process. This is important because of the increasing requirements for sustainability and reduction of environmentally relevant emissions in industrial processes. Material scientists, physicists, process engineers, information scientists and others cooperated in Germany in four technical project areas and a roadmap, namely:

- Materials
- Processes
- Modelling
- Testing Technology
- Refractory Research Roadmap.

The study revealed for example "resource efficiency" and "reduction of harmful emissions" as strategic aims for the future. The analysis showed that research topics existed to meet these challenges and can be identified as principal publication topics in the scientific literature. At the same time, thematic gaps can be identified, which could be the basis for future research activities.
Within the Priority Programme 1418 existed over a six years period an intensive cooperation between the different project areas and subprojects. Additionally, regular meetings of all subprojects took place, for enhancing the scientific exchange and collaboration. An important communication platform was the yearly Freiberg Colloquium on Refractories which invited national and international representatives from industry and research to speak about current developments in the field of refractories. During these events, the results of the subprojects of the Priority Programme 1418 were presented in poster sessions and end of year 2015 the results of the period 2012–2015. The colloquia were opened to the public to establish a direct contact to industry and professional associations. Particularly, the exchange with the VdEh –

see page 2

German Association of Metallurgists – has to be mentioned who accompanied the work of the Priority Programm 1418 intensively. Additionally, numerous activities took place to promote the contact between the research associates in the subprojects. Several field trips took place to visit the steel plant of Salzgitter Flachstahl GmbH, producers of refractories (Hessische Schmelztie- gel und Schamottsteinfabrik Conrad Liphard & Söhne GmbH and several plants of Refratechnik) and Eirich GmbH as producer of process equipment for the refractory industry.

The Priority Programme 1418 achieved in various research areas baseline results for novel refractories due to the interdisciplinary cooperation of the research groups. This is shown by more than 70 peer-reviewed publications, partly as joint publications between subprojects from different project areas. Furthermore, members of the priority programme accomplished more than 100 conference contributions for presenting and discussing the results with the worldwide refractory community. Additionally, four patents were granted for achievements within the Priority Programme 1418. This indicates that a strong network was formed to combine its individual competences advantageously. First findings have already been transferred to industrial applications in joint projects with industrial partners. Further projects are going to follow to realize innovative refractory applications from the results of the Priority Programme 1418 to meet the challenges of sustainability and resource efficiency.

www.ikgb.de
www.spp1418.tu-freiberg.de ■

Remark from the editior:
In the next issue of refractories WORLDFORUM 8 (2016) [2] seven papers will be published. For details see page 4: Preview contents issue 2/2016.

news flash

Germany

Seminar
„Refractories: Theory and Application"

A technical seminar on refractories is scheduled on 27 – 30 April 2016 at the Institute of Mineral Engineering (Gesteinshüttenkunde/GHI) of RWTH Aachen University/DE. This intensive seminar covers the refractory industry from the raw material to the industrial application.
The speakers are experienced refractory experts: Prof. Eschner, Prof. Pötschke, Dipl.-Ing. Krebs and Dipl.-Ing. Mendheim. The seminar is focused on engineers and employers of the refractory industry, the refractory applying and supplying industry, furnace construction, plant engineering and procurement. The seminar is licensed as a postgraduate professional education. www.feuerfest.info

Great Britain

Non-Metallurgical Bauxite & Alumina: Global Industry, Markets & Outlook

The 9th Edition, 2016 of this maket report is now available from Roskill Information Services Ltd/GB. Production of refractories accounted for over 20 % of non-metallurgical bauxite and 60 % of speciality calcined alumina use in 2015, including material used both directly and indirectly via an intermediate product (such as brown fused alumina). World refractory production was just over 35 Mt in 2015, a reduction of nearly 4 % compared to the prior year. The main driver behind lower refractories output and use has been longer refractory product lifetimes combined with lower demand from end markets – namely iron and crude steel.
In 2015, Chinese crude steel production fell for the first time in modern memory, from 822 Mt in 2014 to a projected 812 Mt. While Chinese steel output is expected to contract further in the period out to 2021 – causing a similar decline in refractory use – refractory bauxite and alumina demand is forecast to buck the trend as end users call for higher quality products.
The use of ceramic proppants for hydraulic fracturing has emerged quickly in the last five years and this sector now represents the second largest market for non-metallurgical bauxite, having grown by nearly 40 % per year since 2011. The sudden drop in oil prices, from USD 105/bbl in June 2014 to below USD 45/bbl in January 2015, caused a sharp fall in ceramic proppant use and led to a large build-up of Chinese stocks. Nevertheless, ceramic proppant demand is expected to recover during the forecast period as new unconventional hydrocarbon fields are developed.
Elsewhere, speciality calcined alumina has benefitted from the rise of technical ceramics and aluminosilicate glass. Aluminosilicate glass is expected to represent the highest growth market for calcined alumina out to 2021, because of its use as the substrate for thin film transistors (TFT) used in liquid crystal display (LCD) panels
Aluminium chemicals continue to be the largest market for commodity aluminium trihydrate (ATH), and in particular aluminium fluoride – which has profited from a strong primary aluminium market in China. Flame retardants are forecast to be the fastest growing sector for ATH, where tighter safety regulations are spurring demand for the speciality mineral filler.
Demand for both calcined alumina and ATH is projected to grow in excess of global GDP in the period out to 2021. Non-metallurgical bauxite demand is likely to grow at slightly under GDP as its use in some applications – such as Portland cement, slag adjusters and chemicals – could remain stable or contract slightly. The main highlights are likely to be the ceramic proppants and mineral wool sectors.
www.roskill.com

Italy

10th Aluminum Two Thousand World Congress

The Aluminium Two Thousand World Congress has reached its 10th edition, which will be held in Verona, Italy, 20 – 24 June 2017, following the great successful participation of the past edition in Florence 2015 and the previous ones. The goal of the congress is to analyse all the aspects of the aluminium chain, to meet colleagues from around the world, to join technical and scientific experts, to exchange ideas and advices and to give your own contribution to the growth of the aluminium industry and the improvement of technology.
The 2017 edition will be bigger and unique since there will be three events in one.
The special and successful joint venture with ICEB (the International Conference on Extrusion and Benchmark) is renewed. The 6th ICEB will be organized together with DIEMTech, the Engineering Extrusion Division of Bologna University/IT.
Thanks to a new partnership with Verona Fiere/IT, the 2017 Aluminium Two Thousand – ICEB Congress will be held along with Metef Exhibition (21 – 24 June 2017). The International Conference on Extrusion and Benchmark (ICEB) has become the biggest event in Europe related to the recent developments on Extrusion Technology and its analysis by FEM simulation.
Metef is the Expo of customized technology for the aluminium and innovative metals industry, with more than 10 000 visitors from 60 different countries. It is the only international event in the metals sector offering a comprehensive exhibition on the whole production chain, from raw materials, processing, machinery, and plants, to products, and applications.
The three events in one will bring together "aluminium and light alloys" specialists in a single venue. It will create a very attractive and unique opportunity for industry managers, technicians, researchers, technology suppliers, and other qualified speakers, who will have the opportunity to meet highly qualified colleagues from all over the world and stay up-to-date on the latest researches, industrial applications, and the trends for the future.
www.aluminium2000.com, www.ice-b.net

Worldwide

Crude Steel Output Decreased by 2,8 % in 2015

The World Steel Association (worldsteel) published the year 2015 statistics for crude steel. The production reached 1622,8 Mt for the year 2015, down by –2,8 % compared to 2014. Crude steel production decreased in all regions except Oceania in 2015.

Annual production for Asia was 1113,8 Mt of crude steel in 2015, a decrease of –2,3 % compared to 2014. China's crude steel production in 2015 reached 803,8 Mt, down by –2,3 % on 2014. China's share of world crude steel production increased from 49,3 % in 2014 to 49,5 % in 2015. Japan produced 105,2 Mt in 2015, down by –5,0 % compared to 2014. India's crude steel production for 2015 was 89,6 Mt, up by 2,6 % on 2014. South Korea produced 69,7 Mt of crude steel in 2015, a decrease of –2,6 % compared to 2014.

In 2015, the EU (28) produced 166,2 Mt of crude steel, a decrease of –1,8 % compared to 2014. Germany produced 42,7 Mt of crude steel in 2015, down by –0,6 % over 2014. Italy produced 22,0 Mt in 2015, a decrease of –7,1 % over 2014. France's crude steel production in 2015 was 15,0 Mt, down by –7,2 %. Spain produced 14,9 Mt of crude steel in 2015, an increase of 4,4 % compared to 2014.

Crude steel production for 2015 in North America was 110,7 Mt, a decrease of –8,6 % compared to 2014. The US produced 78,9 Mt of crude steel, down by –10,5 % on 2014.

The CIS showed a decrease of -4,3 % in 2015, producing 101,5 Mt of crude steel. Russia* produced 71,1 Mt of crude steel, down by –0,5 % on 2014 and Ukraine* recorded a decrease of –15,6 % with a year-end figure of 22,9 Mt (*both figures are not finally confirmed).

Annual crude steel production for South America was 43,9 Mt in 2015, a decrease of –2,5 % on 2014. Brazil produced 33,2 Mt in 2015, down by –1,9 % compared to 2014.

In December 2015, world crude steel production for the 66 countries reporting to worldsteel was 126,7 Mt, a decrease of –5,7 % compared to December 2014. The crude steel capacity utilisation ratio of the 66 countries in December 2015 was 64,6 %. This is –4,9 % lower than December 2014. In January the production was 128 Mt, a –7,1% decrease compared to January 2015 The average capacity utilisation in 2015 was 69,7 % compared to 73,4 % in 2014. www.worldsteel.org

Canada

Orbite Provides Update on HPA Construction

Orbite Technologies Inc. provided an update on construction of its HPA plant. As the company reported on December 2015, a dispute with one of its suppliers resulted in a delay in equipment delivery and installation. Following settlement of the dispute and subsequent delivery of the withheld parts, work on the calcination system installation recommenced early in January 2016. The project is now back on the correct construction sequence and is progressing according to plan, with installation of all major mechanical equipment, including the calciner and decomposer, now completed.

„The list of items to be done prior to full commissioning of our HPA plant has become short and straightforward," stated Glenn Kelly, CEO of Orbite. „Although the supplier dispute meant we were not able to commence operations prior to year-end, we are back on track towards completion as per schedule. We are very pleased with how commissioning of the various plant systems is progressing to date, and are confident of successfully completing the final steps prior to commencing commercial production this quarter."

Orbite Technologies Inc. is a Canadian cleantech company whose innovative and proprietary processes are expected to produce alumina and other high-value products, such as rare earth and rare metal oxides, at one of the lowest costs in the industry, and in a sustainable fashion, using feedstocks that include aluminous clay, kaolin, nepheline, bauxite, red mud, fly ash as well as serpentine residues from chrysotile processing sites. Orbite is currently in the process of commercializing its first HPA Plant in Cap-Chat. The first intellectual property family is patented in Canada, USA, Australia, China, Japan and Russia. The company also operates a state of the art technology development center in Laval, Quebec, where its technologies are developed and validated.

www.orbitetech.com

Worldwide

Global Refractories Market – Trends and Forecasts 2015 to 2010

Global refractories market is currently valued at USD 40,9 billion in 2014 and is expected to reach USD 54,8 billion by 2020, showing a Compound Annual Growth Rate (CAGR) of 5 %. In terms of tonnage, the global market was at 39,8 Mt/a in 2014 and is expected to reach 48,6 Mt by 2020. China will maintain its top position among countries, with a market share of more than 50 % in the refractories market.

The gains registered in recent years because of a moderation in raw material costs and refractories prices were not as strong. The iron and steel market will reportedly continue to dominate global refractories sales, accounting for more than three-fifths of all 2020 product-demand in volume terms.

The volume of refractories consumed is projected to rise in the USA, Western Europe, and Japan following an extended period of decline, as economic conditions strengthen in these areas and output of ferrous metals and other refractories-using products rebounds. Output gains in these areas are more likely to result in higher refractories demand because the manufacturing techniques used are already so efficient that it will be much difficult to reduce refractories consumption on a per unit output basis than in less developed countries. Due to their greater use of more costly, high-quality products, the USA, Western Europe, and Japan will account for a larger share of the world refractories market in dollar terms in 2020 than they will in tonnage.

The world average consumption of refractories per tonne crude steel was 15 kg/t in 2014, while China's average was 20 kg/t. The growing demand for refractories in the Asia-Pacific region is the major driving factor of the market.

Twenty years ago, glass consumed 11–13 kg/t of refractories, a figure that has dropped to 4,5–5,5 kg/t today. Steel, on the other hand, has reduced consumption from 30 kg/t in 1980 to 10 kg/t today.

Strong growth in emerging markets is the main driving force for the refractories market. In addition, high demand from the glass industry is also expected. Globally glass industry consumes 0,75–1 Mt/a of refractories, far less than steel. The demand for higher-performance refractories such as magnesia-zircon is increasing. Over 95 % of refractories used in the glass industry are shaped. Monolithics are used in combination with shapes.

Environmental concerns prove to be the major restraint for the refractories market. Moreover, because of moderation in raw material costs and refractories prices, growth is restricted.

The report elucidates the situation of refractories around the world and studies its markets by end-user industry, which include iron and steel, energy and chemicals, nonferrous metals, cement, cera-

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www.refractories-worldforum.com

news flash

mics, glass and others; and by product type: magnesite and chrome, zircon and zirconia, silicon carbide, graphite and carbon, high-alumina and fireclay among others.
Lastly, the report is divided by geography – North America, Europe, Asia-Pacific (APAC), South America and Middle-East and Africa (MEA); where in the market share of each region is analyzed and estimates are provided for the next 6 years.
www.researchandmarkets.com

USA

Alcoa to Delay Curtailment of Intalco Smelter

Lightweight metals leader Alcoa announced in January 2016 that it will delay the curtailment of its Intalco works smelter in Ferndale until the end of the second quarter of 2016. The plant was initially scheduled to curtail by the end of the first quarter.
The company announced a full curtailment of the Intalco smelter (230 kt) on 2 November 2015, with the plant's casthouse continuing to operate. However, recent changes in energy and raw material costs have made it more cost effective in the near term to keep the smelter operating to provide molten metal to the plant's casthouse.
Once all announced curtailments and closures are complete, the company will have removed approximately 25 % operating smelting capacity and approximately 20 % of operating refining capacity by mid-2016. Alcoa will have globally 2,1 Mt of operating smelting capacity and 12,3 Mt of operating refining capacity remaining.
www.alcoa.com

Germany

Enhancing the Efficiency of Production Processes in Times of Industry 4.0

In order to give more importance to the sector Electrical Engineering + Automation and to strengthen it as independent technology, HAVER & BOECKER has founded the company HAVER Automation GmbH & Co. KG located in Münster/DE becoming effective as of 1 January 2016. The foundation of HAVER Automation is an important step towards the future for HAVER & BOECKER as experts for packaging, palletizing and loading technology, particularly because process optimizations and efficiency increases in machine and plant engineering are driven by the terms Industry 4.0, Smart Factory und Internet of Things, says Wolfgang Schlüpmann, MD of HAVER Automation. In cooperation with its customers, the company develops customer-specific and industry-specific automation solutions for the cement, building products, chemical, mining and food industries.
Within the HAVER & BOECKER company, HAVER Automation will act as independent technology company. In implementing the "Time to Chain" motto, the close integration of the technologies into the whole company plays a decisive role. "Time to Chain" symbolizes the linking of all process steps comprising transport, storage, mixing, filling, packaging, palletizing, and loading of bulk materials and fluids. By linking these process steps to build an overall system and with the help of innovative automation solutions, all systems, machines and components are integrated into the customers' logistic processes and thus processes are optimized and made more efficient. This leads to an intelligent production and to new business models. www.haverboecker.com

Russia

Record Durability in Converter Lining was Reached at JSC ArcelorMittal Temirtau

An absolute record was broken at the converter workshop of the JSC ArcelorMittal Temirtau (town Temirtau, Kazakhstan): service life of the 300-t converter Nr. 2 lined with magnesia-carbon bricks made by Magnezit Group reached 5378 heats. The former record of converter lining service life was achieved in March 2015 in converter Nr. 1 lined with bricks of Magnezit Group as well. At that time service life of the lining amounted to 5027 heats that is actually two times more than in 2014.
www.magnezit.com

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Manufacturing & Performance of High-Temperature Materials

preview of issue 2/2016 (extract)

Company Profiles / Interviews
Dong Feng/CN,
Beck+Kaltheuner/DE

Reports
- Review IREFCON 2016
- Glass Problems Conference 2015

Markets & Economy
- Refractories for the Chemical and Petrochemical Industry

Papers
Refractory – Initiative to Reduce Emissions – "FIRE" (Priority Programme 1418 of the German Research Foundation):

- Physical and FE-Simulation of Thermal Shock Behavior of Refractory Ceramics (BTU Cottbus/DE)
- Functionally Graded Materials Made by Water-based Multilayer Technology (Fraunhofer IKTS/DE)
- Cellular Magnesia/Carbon Refractories: Processing, (Thermo-)Mechanical Characterization and FE Modeling (University Saarland/DE)
- Fracture Process Zone in Refractory Castables Containing Eutectic Aggregates after High Temperature Thermal Shock (RWTH Aachen/DE)
- Manufacture of Refractory Multilayer Composites with Optimised Thermal and Chemical Properties Via the Tape Casting Process (University Erlangen-Nuremberg/DE)
- Improved Thermal Shock Resistance of Magnesium Aluminate Spinel Ceramics by Aluminum Titanate Additions (TU Bergakademie Freiberg/DE)

Special Circulation at:
- MagMin – Dusseldorf/DE, 13.-15.04.2016;
- GOMD 2016 – Madison/US, 22.-26.05.2016;
- DGG – Goslar/DE, 06.-08.06.2016;
- Expo Aluminio – Sao Paulo/BR, 07.-09.06.2016;
- ICC6 – Int. Congress on Ceramics – Dresden/DE, 21.-28.08.2016

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