

SFB 920



Multifunktionale Filter für die Metallschmelzefiltration – ein Beitrag zu Zero Defect Materials

NEWSLETTER

4 (1/2013)

DFG Deutsche Forschungsgemeinschaft

TU BERGAKADEMIE FREIBERG
TECHNISCHE UNIVERSITÄT BERGAKADEMIE FREIBERG
The University of Resources. Since 1765.

DKG Deutsche Keramische Gesellschaft e. V.



DEAR READERS,

Excellent basic research and an effective transfer of research results into economically reasonable applications are fundamentals of an innovation system. Facing economic challenges worldwide, promoting basic and applied research as well as the transformation of research findings into innovative products and services is critical for the competitiveness of any national economy.

Against this background, appropriate education and training of young researchers matters. The Collaborative Research Center 920 is supporting its doctoral students in several ways, thus enabling them for excellent research and successful knowledge transfer.

Details on these and other activities, results and next steps are available in our latest issue of this newsletter. Further information is provided at <http://sfb920.tu-freiberg.de>. We hope you'll enjoy the newsletter

Yours sincerely,

Prof. Dr.-Ing. habil. Christos G. Aneziris
CRC 920 Coordinator

Prof. Dr.-Ing. habil. Horst Biermann
CRC 920 Vice Coordinator

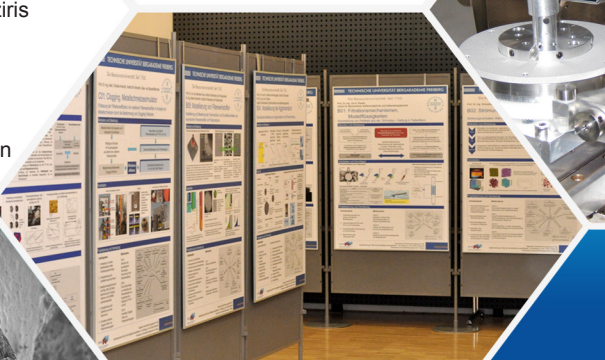
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INTENSIVE DIALOGUE BETWEEN RESEARCH AND INDUSTRY

Again, the 3rd Freiberg Refractory Forum offered rich opportunities for an intense exchange between scholars and industry representatives concerning research efforts and results on innovative refractory materials. The number of attendees gave testimony to an increasing interest in materials research and in the establishment of deeper links between research, industry, and industrial associations. With regard to an improved knowledge transfer from academia to industrial practice, intertwining these actors is of utmost importance.

More than 100 representatives from industrial companies, industry-related organizations, and universities from Germany, the Netherlands, France and Austria attended the 3rd Freiberg Refractory Forum that took place on December 3rd at TU Bergakademie Freiberg.

The forum aimed at reflecting needs for innovative refractory materials and materials properties relevant for high temperature applications. Participants discussed the emerging demand for refractory materials and components, the impact of novel manufacturing processes on the materials performance and issues of quality management of refractory materials.

Discussions revealed important avenues for future research and a great variety of relevant research topics with a strong focus on novel, advanced and environmentally friendly refractories. Attendees agreed that refractory materials properties have a significant impact on the quality of metallurgic products, on their performance, on the security and lifetime

of manufacturing aggregates, on energy consumption and toxic emissions. Therefore, multi-level efforts in research and development are needed. Tasks range from exploring important materials characteristics and approaches for functionalizing materials to the generation of flexible and complex components, new approaches for analyzing and testing materials under extreme conditions up to methods for modeling and simulating materials behavior which permit, for instance, tailoring components for high temperature aggregates to relevant thermal, chemical and mechanical loadings.

With regard to an economically reasonable adaptation of research results and the identification of new research questions, an enhanced dialogue is needed between research institutions, industry partners, and industrial associations. The Freiberg Refractory Forum aims at establishing a reliable platform for these dialogues and an extended exchange between actors in all spheres.

Moreover, the forum served as a valuable opportunity for Ph.D. students involved in the CRC 920 "Multi-Functional Filters for Metal Melt Filtration - Contribution towards Zero Defect Materials" for extending their professional knowledge. "Ph.D. students benefit greatly from formats such as the Refractory Forum," the CRC coordinator Professor Dr. Aneziris said. Meeting experts from research and the industry provides valuable insights into industrial requirements and, derived from that, no-



Photo: Attendees of the 3rd Refractory Forum at TU Bergakademie Freiberg.

vel tasks for research. Doctoral students learn more about application scenarios which extends their understanding of relationships between basic research and its impact on industrial processes.

To this end, the CRC 920 aims at involving international partners, too. In 2013, the 10-years jubilee of the scientific dialogue with the Wuhan University (China) will be celebrated. These celebrations will provide an excellent opportunity for inviting leading experts from China and for initiating an intensive exchange of research tasks and results with colleagues from Germany and other countries. Facing a strong demand for steel and steel products, in recent years China has fostered a substantive development of its research landscape and infrastructure. ■



Photo: Opening speech of the 3rd Freiberg Refractory Forum by Professor Dr. Christos G. Aneziris, coordinator of the CRC 920.

EXCELLENT OPPORTUNITIES FOR PROMOTING YOUNG SCIENTISTS

In March 2013, TU Bergakademie hosted the “International Spring School of SUPSI and CRC 920.” Ph.D. students of the CRC 920 found excellent opportunities for exchanging ideas and experiences with their international guests. Discussions focused on approaches for modeling foam structures and properties relevant for high temperature applications.

The coordinator of the CRC 920, Professor Dr. Christos G. Aneziris, and Professor Dr. Alberto Ortona from the Institute CIM for Sustainable Innovation at the University of Applied Science and Arts of Southern Switzerland SUPSI in Manno (Switzerland) opened the “**International Spring School of SUPSI and CRC 920**” as joint colloquium at the TU Bergakademie Freiberg.

Subsequent to the opening session, the guests from Switzerland presented insights into CFD inside cellular materials, approaches for explaining wetting by molecular dynamics, reactive capillary infiltration, and thermo-mechanical properties. The second day was dedicated to presentations of selected research results gained in the CRC 920, including on the velocity behavior of filter structures or geometrical modeling of foam structures.

The Institute CIM for Sustainable Innovation aims at providing capacities to industrial firms for applied research. Among others, the institute deals with the development of products based on high-tech materials, thermal and fluid-dynamic analyses and high-velocity impact simulation. Utilizing approaches of multi-scale simulation, ways are sought to predict physical-chemical properties of nano-structured composite materials.

A workshop to be held in June 2013 at SUPSI in Lugano will provide more details in the institute’s research activities. Entitled “**Porous Ceramics for CSP**,” the workshop invites scholars, engineers, and

users to explore the usage of ceramic materials for energy storage in solar power plants.

Moreover, Ph.D. students from the CRC 920 as well as from CRC 799 were invited to the 24th Colloquium of “**Mechanisms of Fatigue**.” The colloquium was chaired by Professor Dr. Horst Biermann, vice coordinator of the CRC 920, and Professor Dr. Werner Skrotzky, TU Dresden.

A workshop “**Cleanness of Si**” offered by engineers from Elkem AS Norway provided insights into industry-related demands for silicon purity and degree of crystallinity for solar technologies.

The series of workshops and colloquia, aiming at training doctoral students of the CRC, will be continued in August 2013 with an international “**Workshop on the mechanical modeling of random open cell foams**.” Numerous national and international experts on structural mechanics, stochastic geometry and materials testing are expected. Topics of this workshop will include, for instance, structural modeling of open cell foams, image processing methods, and mechanical testing of open foam structures. ■



Photo: Information, training, and mutual networking are core elements of the CRC’s activities for promoting young researchers.



Photo: Keynote speakers of the “International Spring School of SUPSI and CRC 920”, Professor Alberto Ortona, Professor Maurizio Barbato, Dr. Danilo Sergi und M. Eng. Claudio D’Angelo (all with Institute CIM for Sustainable Innovation, SUPSI, Manno, Switzerland) (from left to right).



Photo: Professor Dr. Christos G. Aneziris (left) and presenters of the workshop “Cleanness of Si”, Dipl.-Ing. Lutz Stephan (Elkem Germany GmbH), Dr. Karl R. Forwald, and Dipl.-Ing. Ragnar Tronstadt (both with Elkem Technology AS, Norway) (from left to right).

WORKING GROUPS' REPORT

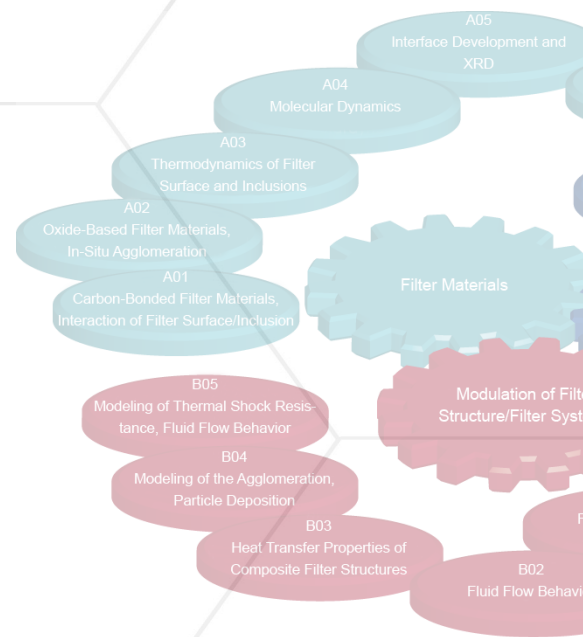
Research teams in the CRC 920 are connected in four working groups, thus ensuring targeted activities, close collaborations between subprojects, and intensive exchanges between all researchers involved. Young scientists are taking responsibility for coordinating these working groups - a measure the CRC has taken to support young scientists already in early career stages, to promote their capabilities to work independently as well as in teams and to strengthen their management skills.

Working Group 1: "Metal melt/inclusions, active/reactive filter materials, boundary surface design" (Coordination: Dipl.-Ing. Claudia Voigt)

- High-temperature DTA analyses for gaining experimental data for thermodynamic modeling, tests for determining reactions between the ceramic filters (with varying coatings) and the metal melts (A03), supplemented by quenching tests and c_p measurements on intermetallic phases,
- Tests of different methods to insert non-metallic inclusions and investigations of the impact of nozzle roughness on clogging behavior using the metal melt simulator (C01), subsequent characterization of the tested nozzles employing, among others, CT (C01, S01) and SEM analyses,
- Evaluation of filter efficiency of industrially tested active and reactive filter materials (A01),
- Generation and characterization of filters with active coating for aluminum infiltration (A02), characterization of the filters using CT (S01), SEM, E-Module measuring, and strength tests,
- Calculation of heat capacity for Al_3FeSi_2 and $Al-FeMgSi$ structures using Density-Functional Perturbation Theory (A04),
- Analyses of interface reactions between coated and uncoated filter ceramics and steel melt or aluminum alloy, respectively, during Spark Plasma Sintering and with varying exposure times using SEM (EDX, EBSD), ESMA and XRD, thus investigating the influence of different coatings on inserted Al_2O_3 inclusions (A06),
- Testing of the active filters using facilities of the Institute of Foundry (TU Freiberg) and of industry partners (S03, A02).

Working Group 2: "Modeling and designing of the filter geometry" (Coordination: Miguel Mendes, Ph.D.)

- Investigation of the effect of coating the particles and filter with different materials on the formation of agglomerates and filtration efficiency (B01, B04),
- Investigation of the filtration efficiency using a 2D numerical model for the fluid flow and particle tracking (without agglomeration) (B02),
- Preparation of tests to measure permeability and volumetric heat transfer coefficient, measurement of thermo-physical properties of carbon-bounded alumina material (B03, A05, C01, C02),
- Numerical studies on the agglomeration of alumina particles, continuation of works on the stochastic theory of particle agglomeration, application of the QUI-PIC method for investigating the ability of particles to form agglomerations (B04, B01),
- Investigations of mechanical properties of the Kelvin cell (B05),
- Integration of a compression algorithm developed in S02 into the Lattice Boltzmann method and development of a framework for the particle tracking (including particle collision) (B05, S02).



A06
Dynamic Interface Generation in a Spark Plasma Sintering

C01
Clogging Parameters, Melt Simulation

Filtration Efficiency, Material Behavior

B01
Filtration Mechanism, Sample Melts

C02
Form Stability of Carbon-Bonded Filter Materials

C03
Small Punch Test

C04
Cyclic Fatigue of Metallic Components

C05
Toughness Behavior of Metallic Components

Working Group 4: "Mechanical properties, metallic materials, critical inclusions" (Coordination: Dr.-Ing. Sebastian Henkel)

- Fabrication of different casted steel and aluminum plates using different filter materials (S01),
- Preparation of samples and execution of static and cyclic tests for determining mechanical and fatigue properties of the steel and aluminum materials (C04, C05),
- Successful HIP treatment for reducing shrinkage porosity in steel and aluminum plates (S01), Impurification of an aluminum model melt by adding oxidized chips (S01),
- Contamination of aluminum model melt with oxidized flakes (S03),
- Application of the PREFIL procedure for aluminum for determining the total content of non-metallic inclusions (A01, S03),
- Definition of required simulation parameters for point estimation methods (S01, C04, C05),
- Stochastic evaluation and simulation of particle distribution in different steel plates (S01, C04),
- Analysis of volume extension and band-type formations of non-metallic inclusions in the cast steel 42CrMo4 (S01, C04, C05),
- Contamination of aluminum model melt using a copper ingot (S03, S01, C04).

Working Group 3: "Thermo-mechanical characteristics of filter materials and structures" (Coordination: Dipl.-Wirt.-Ing. Yvonne Klemm)

- Final experiments on contaminated and functionalized filters (A01),
- Generation of filters with active coatings and start of casting experiments (A02),
- Analysis of agglomeration and deagglomeration mechanism of particles, development of approaches for improving filter efficiency by modifying surface energy (through hydrophobising/hydrophilizing) (B01),
- Investigations on thermal expansion of samples with different Carbores content (B03),
- Visualizing of the filter process (B03),
- Elaboration of methods for simulating mechanical and thermo-mechanical behavior of deterministic foam structures (B05),
- Sample production based on slurry, sample generation for high temperature crushing and bending strength measurements depending on binder content, porosity, coking temperature, sinter method and coating (C02),
- Investigation of the impact of the microstructure of uniaxially pressed samples on thermomechanical properties (C03).

BEST PAPER AWARD FOR CRC 920 RESEARCHERS



Photo: Dipl.-Ing. Tilo Zienert, research assistant in subproject A03 of the CRC 920.

Recent findings on thermodynamic modelling and evaluation of complex, multiple-component and multiphase systems accomplished by CRC researchers have received international acknowledgment. On an international conference in San Sebastian (Spain) the paper “Phase relations in the ZrO_2 - Sm_2O_3 - Y_2O_3 - Al_2O_3 system: experimental investigation and thermodynamic modelling,” (International Journal of Materials Research, 103, 12, pp. 1469-1487) by Olga Fabrichnaya, Galina Savinykh, Tilo Zienert, Gerhard Schreiber (Institute of Materials Science, TU Bergakademie Freiberg) and Jürgen Seifert (Institute of Applied Physics, KIT Karlsruhe) received the Best Paper Award of the Alloy Phase Diagram Commission CALPHAD.

The research results emanated from subproject A03 on “Thermodynamics of the filter wall and of inclusions,” which deals with the determination of quantitative information on microstructure development and interface reactions in active and reactive filter systems. In her research, the subproject’s coordinator Dr. Olga Fabrichnaya, focuses on modelling and experimental investigations of oxide systems. By employing the thermodynamic optimization method, she developed thermodynamic databases for numerous multiple-component systems. Her work is of great interest to materials science and mineralogy.

Tilo Zienert, research assistant at the Freiberg Institute of Materials Science and since 2011 doctoral student in subproject A03 of the CRC 920, was involved in these investigations already during his study of Materials Science at the Freiberg University. Results of his master thesis contributed to the awarded publication.

In his dissertation, Tilo Zienert is dealing with thermodynamic modelling of materials systems relevant to the CRC 920. His work is focusing on investigations of thermodynamic properties and reactions in active and reactive filter materials, between the filter material and diverse coatings as well as between filter, coating and melt (aluminum or steel) containing non-metallic inclusions. His calculations supplement experimental data and, thus, help enhancing the understanding of results researchers in other subprojects gain through these experimental investigations. In turn, experimental data permits refining thermodynamic data sets.

By establishing Collaborative Research Centers (CRC), the German Research Foundation DFG aims at promoting education and training especially for young researchers. Additional to the funding doctoral positions DFG provides substantial financial resources for educational programs, workshops, international visits and internships as well as programs for visiting scholars. These measures are intended to ensure expeditious and high-quality Ph.D. projects and to increase young researchers’ visibility at early stages of their careers by integrating them in national and international academic networks. ■

CRC 920 AT THE DKG ANNUAL MEETING

From March 18 to March 20, the Annual Meeting of the German Ceramic Association (DKG) took place in Weimar. About 240 participants from research and industry presented and discussed new research results on ceramic materials.

The CRC 920 was represented by its coordinator, Professor Dr. Aneziris, as well as by the research assistants Marcus Emmel (A01), Claudia Voigt (A02), and Steffen Dudczig (C01).

Marcus Emmel presented results on the "Development of active and reactive filters for steel melt infiltration based on carbon-bonded systems." His presentation highlighted the impact of various filter surfaces on the filtration of non-metallic inclusions.

Claudia Voigt introduced investigations on "The impact of slurry composition on the generation of Al_2O_3 foam ceramics" employing

the Schwarzwald method and its parameters. Investigations of the clogging behavior of a steel melt depending on the chemical properties of the nozzle surface was presented by Steffen Dudczig. He spoke on "Evaluations of active and reactive filter materials: investigations in a steel cast simulator."

The German Ceramic Association DKG e.V. involves more than 600 individual and 250 institutional members. As such, it is the largest professional association in the field of ceramics and, moreover, one of the oldest ceramic associations worldwide. ■



Photo: (from left to right): Steffen Dudczig, Claudia Voigt and Marcus Emmel presented the CRC 920 at the DKG Annual Meeting.

CRC 920 PRESENTS NEW CORPORATE VIDEO

By employing several public relations activities the team of the CRC 920 aims at addressing a wider audience far beyond professional experts. These activities are intended to raise public interest in subjects and methods of materials science and engineering in general and, in particular, to enhance public understanding of goals and results the CRC 920 is pursuing in basic research. Additionally to existing measures, including the CRC's webpage, regular press releases and newsletters as well as public presentations at university events such as the university's "Open Days," the CRC 920 now presents its new corporate video.

"Our intention was to shed light on the importance of our research and to visualize the collaboration between scholars from various disciplines. Moreover, the video emphasizes the significant contribution our young research-

ers make and our efforts to promote the Ph.D. students who are involved in the CRC's research activities," the CRC's manager Dr. Undine Fischer said.

A professional film production team had been invited to visit facilities and laboratories of the CRC and to picture visions, goals and activities the researchers at TU Freiberg are involved with. Additionally, the film team had the chance to join the industrial tests of the newly developed filter materials for steel cast at the Edelstahlwerke Schmees GmbH in Pirna.

The corporate video entitled "Smart filters for advanced security" will be published on the Internet. Furthermore, it will be supporting presentations of the CRC on exhibitions, conferences, and university events, thus familiarizing a public audience with the fascinating world of materials science. ■

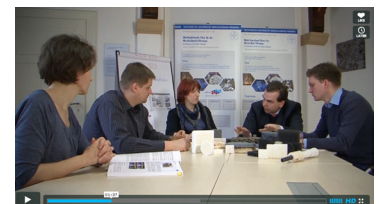


Photo: A new video offers fascinating insights into research activities of the CRC 920.

RECENT PUBLICATIONS

Project area A - Filter materials**Subproject A01**

Aneziris, C. G., Emmel, M., Stolle, A. (2012): Multifunctional carbon bonded filters for metal melt filtration, in *Advances in Bioceramics and Porous Ceramics V* (eds R. Narayan, P. Colombo, M. Halbog and S. Mathur), John Wiley & Sons, Inc., Hoboken, NJ, USA. Published Online: 3 DEC 2012, Published Print: 19 NOV 2012, Print ISBN: 9781118205969, Online ISBN: 9781118217504. DOI: 10.1002/9781118217504.ch16.

Aneziris, C. G., Schröder, C., Emmel, M., Schmidt, G., Heller, H.-P., Berek, H. (2013): "In Situ" Observation of Collision between Exogenous and Endogenous Inclusions on Steel Melts for Active Steel Filtration. *Metallurgical and Materials Transactions B*. Vol. 44B, Iss. 2, DOI: 110.1007/s11663-013-9828-6.

Emmel, M., Aneziris, C. G. (2012): Development of novel carbon bonded filter compositions for advanced steel melt filtration. *Ceramics International*, Vol. 38, Iss. 6, August 2012, pp. 5165-5172. DOI: 10.1016/j.ceramint.2012.03.022.

Emmel, M., Aneziris, C. G. (2012): Functionalization of carbon-bonded alumina filters through the applications of active oxide coatings for the steel melt filtration. *Journal of Materials Research*. JMR Manuscript No. JMR-2012-0828. DOI 10.1557/jmr.2013.56.

Emmel, M., Aneziris, C. G. (2013): Development of active and reactive carbon-bonded filters for steel melt filtration. UNITECR 2013, September 10-13, 2013, Victoria, Canada. Abstract submitted: 27.09.2012, Manuscript accepted: 07.05.2013.

Emmel, M., Aneziris, C. G. (2013): Entwicklung aktiver und reaktiver Filter für die Stahlschmelze-Filtration auf Basis kohlenstoffgebundener Systeme. DKG Jahrestagung, 18.-20. März 2013.

Emmel, M., Aneziris, C. G., Stolle, A. (2012): Multifunktionale kohlenstoffgebundene Filter für die Metallschmelzefiltration. Tagungsband zum 15. Werkstofftechnischen Kolloquium WTK, 20.-21. September 2012 in Chemnitz. Band 47, S. 392-396. ISBN 978-3-00-039358-7.

Aneziris, C. G. et al.: Functional coatings on carbon bonded filters for advanced metal melt filtration (Keynote). 13. ECerS, 23.-27.06.2013, Limoges (Frankreich), eingeladen: 27.03.2013.

Subproject A02

Voigt, C., Aneziris, C. G. (2012): Optimierung der Herstellung von Schaumkeramikfiltern aus Al_2O_3 . 15. Tagungsband zum Werkstofftech-

nischen Kolloquium WTK, 20.-21. September 2012 in Chemnitz. Band 47, S. 397-403. ISBN 978-3-00-039358-7.

Voigt, C., Aneziris, C. G. (2013): Untersuchung des Einflusses von Schlickerzusammensetzung und Beschichtungsverfahren auf die Herstellung von Schaumkeramiken aus Al_2O_3 . DKG Jahrestagung, 18.-20. März 2013. Accepted: 13.11.2012.

Voigt, C., Aneziris, C. G. (2013): Functional Coatings on Reticulated Porous Foam Ceramics made of Alumina for Aluminum Filtration. UNITECR 2013, September 10-13, 2013, Victoria, Canada. Manuscript Proceeding accepted: 17.04.2013.

Voigt, C., Jäckel, E., Aneziris, C. G., Hubáľková, J. (2013): Investigations of reticulated porous alumina foam ceramics based on spray coating techniques with the aid of μ CT and statistical characteristics. *Ceramics International*, Vol. 39, Iss. 3, April 2013, pp. 2415-2422. DOI: 10.1016/j.ceramint.2012.09.001.

Voigt, C., Storm, J., Aneziris, C. G., Abendroth, M., Kuna, M., Hubáľková, J. (2013): The influence of the measurement parameters on the crushing strength of reticulated ceramic foams. *Journal of Materials Research*. Accepted: 26.03.2013.

Subproject A03

Zienert, T., Fabrichnaya, O. (2012): Thermodynamic Assessment and Experiments in the system $MgO-Al_2O_3$. CALPHAD, Volume 40, March 2013, Pages 1-9. DOI: 10.1016/j.calphad.2012.10.001.

Zienert, T., Fabrichnaya, O.: Development of a Database for Al-Fe-Mg-Si system. CALPHAD 2013, 26-31. May 2013, San Sebastian, Spain. Abstract accepted: 16.04.2013.

Subproject A04

Amirkhanyan, L., Weißbach, T., Kortus, J., Aneziris, C. G.: On the possibility of hercynite formation in a solid state reaction at the Al_2O_3 -iron interface: A density-functional theory study. *Ceramics International*. Accepted: 22.05.2013.

Subproject A05

Dopita, M., Rafaja, D. (2012): FAST/SPS compaction of ultra-fine grained and nanocrystalline WC based hard metals. International Symposium on Ceramic Materials and Components for Energy and Environmental Applications CM-Cee, May 20-23, 2012 in Dresden. Accepted: 25.04.2012.

Dopita, M., Chmelik, D., Salomon, A., Rafaja, D.: Spark plasma sintering (SPS) – promising technique for fast synthesis of compact novel high performance materials. IPP-SPS Workshop, Prag, 28.02.2012, Oral presentation.

Dopita, M., Emmel, M., Rudolph, M., Salomon, A., Aneziris, C. G., Rafaja, D. (2013): X-ray scattering on turbostratic carbon structures. 21st Annual Conference of the German Crystallographic Society, 19-22 March 2013, Freiberg, Oral presentation.

Project area B - Modeling of filter structures/ filter systems**Subproject B01**

Heuzeroth, F., Peuker, U. A. (2013): Development of a model system to investigate the filtration efficiency of ceramic foam filters used in metal melt filtration. FILTECH 2013, October 22-24, 2013 in Wiesbaden, Germany. Abstract accepted for presentation: 23.03.2012.

Peuker, U. A., Aneziris, C. G., Trimis, D. (2012): Liquid Metal Filtration – New Approaches. World Filtration Congress WFC11, April 16-20, 2012 in Graz (Austria). Accepted: 08.08.2011.

Subproject B03

Götze, P., Skibina, V., Wulf, R., Emmel, M., Groß, U., Aneziris, C. G. (2012): Determination of effective thermal conductivity of open celled foam ceramics with the transient plane source technique. International Symposium on Ceramic Materials and Components for Energy and Environmental Applications. CMCEE, May 20-23, 2012 in Dresden. Accepted: 21.11.2011.

Götze, P., Wulf, R., Groß, U. (2013): The Effective Thermal conductivity of Alumina Open-Cell Foam Ceramics Measured by the Transient Plane Source Technique. 8th World Congress on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, June 16-20, 2013, Lisbon, Portugal. Abstract accepted for Poster: 06.03.2013.

Subproject B04

Teichmann, J., Ballani, F., van den Boogaart, K. G. (2013): Generalizations of Matérn's hard-core point processes. *Spatial Statistics*. Submitted: 12.09.2012, Vol. 3, February 2013, pp. 33-53. DOI 10.1016/j.spasta.2013.02.001.



Subproject B05

Storm, J. (2012): Modelling foam structures using implicit functions. Proceedings of the Cellular Materials, CELLMAT 2012, November 07-09, 2012 in Dresden. ISBN 978-3-00-039965-7.

Storm, J., Abendroth, M., Liedke, Th., Sieber, T., Emmel, M., Voigt, C., Ballaschk, U., Kuna, M. (2012): Geometrical modelling of foam structures using implicit functions. Materials Science and Engineering Conference 2012, September 25-27, 2012, Darmstadt.

Storm, J., Abendroth, M., Emmel, M., Liedke, Th., Ballaschk, U., Voigt, C., Sieber, T., Kuna, M. (2012): Geometrical modelling of foam structures using implicit functions. International Journal of Solids and Structures. DOI 10.1016/j.ijsolstr.2012.10.026.

Storm, J., Abendroth, M., Kuna, M. (2013): Geometry dependent effective heat conductivity of open-cell foams based on Kelvin cell models. UNITECR 2013, September 10-13, 2013, Victoria, Canada. Manuscript Proceeding accepted: 17.04.2013.

Project area C - Filter efficiency, materials properties**Subproject C01**

Aneziris, C. G., Rungos, V., Dudczig, S., Emmel, M. (2012): Refractories with Improved Thermal Shock Performance Serving Low Carbon Economy. 6th Intern. Symposium on Refractories, 18.-21.10.2012 in Zhengzhou, China. Invited letters page 014-018. ISBN 978-7-5645-1139-5.

Aneziris, C. G., Dudczig, S., Emmel, M., Bereck, H., Schmidt, G. (2012): Reactive Filters for Steel Melt Filtration. Advanced Engineering Materials, Vol.15, Iss. 1-2, February 2013, pp. 46-59. DOI: 10.1002/adem.201200199.

Aneziris, C. G., Dudczig, S., Hubálková, J., Emmel, M., Schmidt, G. (2012): Alumina coatings on carbon bonded alumina nozzles for active filtration of steel melts. Ceramics International, Vol. 39, Iss. 3, April 2013, pp. 2835-2843. DOI: 10.1016/j.ceramint.2012.09.055.

Dudczig, S., Aneziris C. G. (2013): Evaluierung aktiver und reaktiver Filterwerkstoffe in einem Stahlgussimulator. DKG Jahrestagung, 18.-20. März 2013, Weimar.

Subproject C02

Klemm, Y., Hampel, M., Aneziris, C. G., Biermann, H. (2012): Variation in der Rohstoffzusammensetzung und deren Einfluss auf das Gefüge und die mechanischen Eigenschaften von kohlenstoffgebundenem Al_2O_3 -C. Tagungs-

band zum 15. Werkstofftechnischen Kolloquium WTK, 20.-21. September 2012 in Chemnitz. Band 47, S.404-410. ISBN 978-3-00-039358-7.

Klemm, Y., Hampel, M., Aneziris, C. G., Biermann, H. (2012): Variation in raw material composition and shaping route and its influence on the microstructure and mechanical properties of carbon-bonded Al_2O_3 -C. Materials Science and Engineering Conference 2012, September 25-27, 2012 in Darmstadt. Poster accepted: 24.04.2012.

Klemm, Y., Biermann, H., Aneziris, C. G. (2012): Microstructure and mechanical properties of fine grained carbon-bonded Al_2O_3 -C materials. Ceramics International. Ref. No.: CERI-D-12-02535. DOI: 10.1016/j.ceramint.2013.01.108

Klemm, Y., Biermann, H.; Aneziris, C. G. (2013): Different Fabrication Routes for Carbon-Bonded Al_2O_3 -C and their Influence on the Physical and Mechanical Properties. UNITECR 2013, September 10-13, 2013, Victoria, Canada. Abstract accepted: 17.01.2013, Manuscript accepted: 19.04.2013.

Subproject C03

Soltysiak, S., Abendroth, M., Kuna, M. (2013): Influence of the Cabores content on the strength of carbon bonded alumina obtained by means of Small Punch Test. UNITECR 2013, September 10-13, 2013, Victoria, Canada. Abstract submitted: 15.10.2012. Manuscript accepted: 07.05.2013.

Soltysiak, S., Dudczig, S., Abendroth, M., Kuna, M. (2012): Mechanical and optical characterization of carbon bonded alumina using the Small Punch Test. Proceedings of the Cellular Materials, CELLMAT 2012, November 07-09, 2012 in Dresden. ISBN 978-3-00-039965-7.

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Subproject C04

Krewerth, D., Weidner, A., Biermann, H., Emmel, M., Aneziris, C. G., Stolle, A., Eigenfeld, K. (2012): Experimentelle Untersuchungen zum Einfluss verschiedener Gefügeinhomogenitäten auf das VHCF-Ermüdungsverhalten des Stahlgusses GS 42CrMo4. Tagungsband zum 15. Werkstofftechnischen Kolloquium WTK, 20.-21. September 2012 in Chemnitz. Band 47, S. 411-421, ISBN 978-3-00-039358-7.

Krewerth, D., Weidner, A., Biermann, H. (2012): Application of In Situ Thermography for Evaluating the High-Cycle and Very High-Cycle Fatigue Behaviour of Cast Aluminium Alloy Al-Si7Mg (T6). Ultrasonics Journal. DOI: 10.1016/j.ceramint.2013.01.108.

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Krüger, L., Henschel, S., Mandel, K., Radajewski, M. (2012): Studie zur Impulsformung an Split-Hopkinson-Aufbauten. Tagungsband zum 15. Werkstofftechnischen Kolloquium WTK, 20.-21. September 2012 in Chemnitz. Band 47, S. 422-427. ISBN 978-3-00-039358-7.

Complementary subprojects**Subproject S01**

Hubálková, J., Voigt, C., Emmel, M., Aneziris, C. G. (2012): X-ray microtomography of ceramic foam filters for molten metal filtration. Proceedings of the Cellular Materials, CELLMAT 2012, November 07-09, 2012 in Dresden. Accepted: 26.06.2012 (Poster). ISBN 978-3-00-039965-7.

Subproject S02

Lehmann, H., Jung, B. (2012): In-Situ Data Compression for Flow Simulation in Porous Media. The 2012 International Conference on Parallel & Distributed Processing Techniques & Applications (PDPTA'12), July 16-19, 2012 in Las Vegas, Nevada (USA). ISBN: 1-60132-227-5, 1-60132-228-3 (1-60132-229-1)

Lehmann, H., Fiedler, K., Jung, B. (2012): Processing In-Situ Compressed Large Data Sets in VR-based Flow Analysis. 9. Workshop Virtuelle und Erweiterte Realität 2012 der Fachgruppe Virtuelle Realität und Augmented Reality, FH Düsseldorf, 19.-20.09.2012. Proceedings. Shaker 2012. S. 61-70. ISBN 978-3-8440-1309-2.

Lehmann, H., Jung, B. (2012): Applying In-Situ Compression to Hierarchical Scientific Voxel Data. Proceedings of the 1st Virtual International Conference on Advanced Research in Scientific Fields, ARSA-2012, 3-7 December, 2012 in Slovakia. ISBN 978-80-554-0606-0, ISSN 1338-9831.

UPCOMING: UNITECR 2013

The 13th Biennial Worldwide Congress on Refractories will be taking place from September 10 to September 13 in Victoria/Canada. The objective of the UNITECR is to contribute to the progress and exchange of industrial knowledge and technologies concerning refractories. This year, the CRC 920 will be contributing five papers submitted by doctoral students and subproject coordinators.



13th Biennial Worldwide Congress on Refractories

Research on refractories and on novel filters and filter systems are deeply interrelated. During cast processes, abrasion of refractory materials or reactions between refractories and metal melts can cause non-metallic inclusions. Filter systems have therefore to be adapted in such a way that these inclusions can be eliminated. In a long-term perspective, one aim of the CRC 920 is to develop refractories that can serve as active or reactive filter systems. The interdisciplinary meeting of experts at UNITECR 2013 is therefore expected to provide valuable ideas for future research subjects of the CRC. ■

DATES

CONFERENCES AND CALLS FOR PAPERS

64th Freiberg Research Conference BHT, 12.-14.6.2013, TU Freiberg: "Forum of Sustainability - Energy and Resources," further information available at <http://tu-freiberg.de/researchforum>.

13th International Conference of the European Ceramic Society ECeRS 2013, 23.-27.06.2013, Limoges (Frankreich): Further information at <http://www.ecers2013.fr>.

Workshop "Porous Ceramics for CPC Applications," 26.06.2013, SUPSI, Lugano, Schweiz: Registration via e-mail to cinzia.dolci@icimsi.ch; further information at <http://www.supsi.ch/go/CMC4CSP>.

13th Unified International Technical Conference on Refractories UNITECR 2013, 10.-13.09.2013, Victoria (Kanada): further information at <http://unitecr2013.org>.

56th International Colloquium on Refractories, 25.-26.09.2013, Aachen: Informationen on registration and the program at <http://www.feuerfest-kolloquium.de>.

DGM Conference "Intermetallics," 30.09.-04.10.2013, Kloster Banz: Accepted manuscripts are invited for publication in "Intermetallics," (Scopus-cited; IF 1,62). Further information at www.dgm-intermetallics.de.

4th Freiberg Refractory Forum, 27.11.2013, TU Bergakademie Freiberg: Jointly hosted by the CRC 920, the Priority Program 1418, the German Materials Society DGM e.V. and the Steel Institute VdEH.

UPCOMING CRC EVENTS

19.06.2013 - 7. Doctoral students' meeting and workshop on "Steelmaking Refractories" with Prof. Semler (USA)

28./29.8.2013 - Workshop on "Mechanical modeling of open cell foams", organized by the IMFD, TU Freiberg

24.09.2013 - Citavi-Workshop, University library, TU Freiberg

24.10.2013 - Workshop "Ceramic Processing" with Dr. Nold (Eirich GmbH)

27.11.2013 - Workshop on "Modulation of the Young Modules" with Prof. Rodrigues (Brasil)

IMPRESSUM

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TU Bergakademie Freiberg
CRC " Multi-Functional Filters for Metal Melt Filtration - A Contribution towards Zero Defect Materials"

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SFB 920
Multifunktionale Filter für die Metallschmelzefiltration –
ein Beitrag zu Zero Defect Materials