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Program

Electric Field Assisted Sintering and Related Phenomena Far from Equilibrium

March 6 – 11, 2016

Hotel dos Templários
Tomar, Portugal

Conference Chair
Rishi Raj
University of Colorado at Boulder, USA

Conference Co-Chair
Thomas Tsakalakos
Rutgers University, USA

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Sunday, March 6, 2016

16:00 – 18:00	Conference Check–in
18:00 – 19:30	Welcome Reception (Lobby Bar)
19:30 – 22:00	Dinner followed by Reception

NOTES

- Audiotaping, videotaping and photography of presentations are strictly prohibited.
- Speakers – Please leave at least 5 minutes for questions and discussion.
- Please do not smoke at any conference functions.
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Monday, March 7, 2016

07:30 – 08:30 Breakfast

08:30 – 08:35 Welcome – Conference Chairs

Introductory Remarks:
ECI Liaison – Lawrence Kabacoff

Session 1: Flash, Microwave, SPS and Grain Growth – I
Session Chair: Rishi Raj, University of Colorado at Boulder, USA

08:35 – 09:05 **Electric field–induced electronic conduction in bulk oxide ceramics**
Anthony R. West, University of Sheffield, United Kingdom

09:05 – 09:35 **Flash microwave sintering of oxide ceramics**
Kirill I. Rybakov, Institute of Applied Physics, Russian Academy of Sciences; Lobachevsky State University of Nizhny Novgorod, Russia

09:35 – 10:05 **Flash sintering of covalent non–oxide ceramics at low temperatures with low DC electric fields: An *in situ* EDXRD study by synchrotron probe**
Thomas Tsakalakos, Rutgers University, USA

10:05 – 10:25 Coffee Break

10:25 – 10:55 **Field–assisted and flash sintering of nanocrystalline yttria: Densification and microstructural evolution**
Hidehiro Yoshida, National Institute for Materials Science, Japan

10:55 – 11:25 **Electroluminescence and Heating Rates during Flash**
Rishi Raj, University of Colorado Boulder, USA

11:25 – 11:55 **Highly transparent spinel windows by microwave sintering**
Jasbinder Sanghera, Naval Research Laboratory, USA

11:55 – 12:25 Coffee Break

12:25 – 12:55 **The influence of fields and dopants on grain boundary mobility**
Wayne D. Kaplan, Technion – Israel Institute of Technology, Israel

12:55 – 13:25 **Spark plasma sintering of a functionally graded material consisting of a high–alloyed CrMnNi–steel and varying Mg–PSZ content**
Sabine Decker, Technical University Bergakademie Freiberg, Germany

13:25 – 14:30 Lunch

Monday, March 7, 2016 (continued)

Session 2: Flash, Microwave, SPS and Grain Growth – II
Session Chair: Thomas Tsakalakos, Rutgers University, USA

14:30 – 15:00 **Electrical conduction mechanism at high voltages and dielectric breakdown strength in bulk ceramic insulators**
Gerold A. Schneider, Hamburg University of Technology, Germany

15:00 – 15:30 **Oxygen vacancy formation due to DC electric fields during flash sintering in $BaTiO_3$**
Takahisa Yamamoto, Nagoya University, Japan

15:30 – 16:00 **Effect of electric field/current on liquid phase sintering**
Jesus Gonzalez–Julian, Forschungszentrum Jülich GmbH, Germany

16:00 – 16:30 Coffee Break

16:30 – 17:00 **Influence of an electric field on grain growth and sintering in strontium titanate**
Fabian Lemke, Karlsruhe Institute of Technology (KIT), Germany

17:00 – 17:30 **First stage in flash sintering of zirconia based ceramics**
Paul Carry, SIMaP Laboratory, France

17:30 – 18:00 **Effect of (external) electric fields on heterogeneous solid state reactions – Special role of grain boundary diffusion**
Carsten Korte, Forschungszentrum Jülich GmbH, Germany

18:00 – 18:30 Coffee Break

18:30 – 19:00 **Spark and plasma aided densification mechanisms during spark plasma sintering of ceramic powders**
Rachman Chaim, Technion–Israel Institute of Technology, Israel

19:00 – 19:30 **The modification of the temperature gradient in a large sample sintered by SPS**
Mirva Eriksson, Stockholm University, Sweden

19:30 – 21:00 Dinner

21:00 – 22:00 Social Hour

Tuesday, March 8, 2016

07:30 – 08:30	Breakfast
	Session 3: Flash – Various (Experimental) **Session Chair:** Antti Makinen, Office of Naval Research, USA
08:30 – 09:00	**Field and thermal factors in field–assisted consolidation of powder materials** Eugene Olevsky, San Diego State University, USA
09:00 – 09:30	**Direct microwave sintering of gamma–alumina powder: Effect of alpha seeding and magnesia doping** Paul Carry, SIMaP Laboratory, France
09:30 – 10:00	**Phase transformations in real time during flash** Jean–Marie Lebrun, University of Colorado, USA
10:00 – 10:30	Coffee Break
10:30 – 11:00	**Role of defects in electric–field–assisted sintering** Steve Hellberg, Naval Research Laboratory, USA
11:00 – 11:30	**Flash sintering of complex oxides** Luis Perez–Maqueda, Materials Institute, Spain
11:30 – 12:00	Coffee Break
12:00 – 12:30	**Electric field–assisted flash sintering of fine–grained and high–permittivity $CaCu_3Ti_4O_{12}$ electroceramics** Lílian M. Jesus, University of São Paulo, Brazil
12:30 – 13:00	**Flash sintering of ZnO, TiO_2 and other oxides: The origin of onset flash and effects of atmosphere, doping and particle size** Jian Luo, University of California San Diego, USA
13:00 – 13:30	**Estimating ionic conductivity during flash sintering of 8ysz** Daniel Marinha, Saint–Gobain CREE, France
13:30 – 14:30	Lunch
14:30 – 19:00	Afternoon guided excursion to the Templar Castle (Convento de Cristo), a UNESCO World Heritage Site
19:30 – 21:00	Dinner on your own
21:00 – 22:00	Social Hour

Wednesday, March 9, 2016

07:30 – 08:30	Breakfast
	Session 4: Flash and SPS – Various **Session Chair:** Lawrence Kabacoff, USA
08:30 – 09:00	**Flash sintering of glass containing alumina bodies** Mattia Biesuz, University of Trento, Italy
09:00 – 09:30	**The influence of doping on flash sintering condition in $SrTi_{1-x}Fe_xO_{3-\delta}$** Neta Shomrat, Technion, Israel
09:30 – 10:00	**Electric field effects on grain boundary formation and grain growth** Klaus van Benthem, University of California Davis, USA
10:00 – 10:30	Coffee Break
10:30 – 11:00	**Flash obviates constrained sintering** Rishi Raj, University of Colorado Boulder, USA
11:00 – 11:30	**Electrical field effects in spark plasma sintering of hyperstoichiometric UO_2** Marco Cologna, European Commission, Joint Research Centre (JRC), Institute for Transuranium Elements (ITU), Germany
11:30 – 12:00	**Low–temperature spark plasma sintering of transparent ceramics by using SiC molding set** Byung–Nam Kim, National Institute for Materials Science, Japan
12:00 – 12:30	**Electric current as a driving force for interphase growth in spark plasma sintered dielectric composites** Catherine Elissalde, ICMCB–CNRS, France
12:30 – 13:00	**Discoloration of spark–plasma–sintered transparent $MgAl_2O_4$ spinel** Koji Morita, National Institute for Materials Science, Japan
13:00 – 14:30	Lunch
	Session 5: SPS – Various **Session Chair:** Claude Estournès, Université de Toulouse; UPS, INP; Institut Carnot Cirimat, France
14:30 – 15:00	**Engineering of lightweight ceramic composites by spark plasma sintering** Oleg Vasylkiv, National Institute for Materials Science, Japan

Wednesday, March 9, 2016 (continued)

15:00 – 15:30	**Development of electric current activated/assisted sintering (ECAS/SPS)** Salvatore Grasso for Yoshio Sakka, National Institute for Materials Science, Japan
15:30 – 16:00	**Benefits of SPS sintering on microstructure and piezoelectric properties of KNN–based ceramics** Florian Jean, GREMAN, France
16:00 – 16:30	Coffee Break
16:30 – 17:00	**Generating $MgAl_2O_4$ whiskers using carbothermic reactions and SPS/FAST** Anton Salomon, TU Bergakademie Freiberg, Germany
17:00 – 17:30	**The mechanisms of field assisted sintering in metallic systems** Johannes Trapp, TU Dresden IfWW, Germany
17:30 – 18:00	**Microscopic densification mechanisms of metallic systems by spark plasma sintering** Jean–Philippe Monchoux, Centre d'élaboration de matériaux et d'études structurales, France
18:00 – 18:30	Coffee Break
18:30 – 19:00	**Exploring length scale–property relationships in dense nanocrystalline materials** Javier Garay, University of California, San Diego, USA
19:00 – 19:30	**SPS for chemical preparations** Ihor Veremchuk, Max Planck Institute for Chemical Physics of Solids, Germany
19:30 – 20:00	**Ceramics of potassium sodium niobate by field–assisted sintering techniques: Spark plasma sintering versus spark plasma texturing** Paula Maria Vilarinho, University of Aveiro, Portugal
20:00 – 21:00	Dinner
21:00 – 22:30	Poster Session / Social Hour

Thursday, March 10, 2016

07:30 – 08:30	Breakfast
	Session 6: Techniques, Methods and Simulations–I **Session Chair:** Michael Bakas, Army Research Office, USA
08:30 – 09:00	**Microstructure evolution in spark plasma sintered hafnium–tantalum carbides** Ben Boesl, Florida International University, USA
09:00 – 09:30	**Consolidation behavior of bulk amorphous glasses and foils: The effect of current on devitrification kinetics** Olivia A. Graeve, University of California, San Diego, USA
09:30 – 10:00	**Processing high strength low oxide and metal impurity ZrB_2 ceramics using boron carbide and spark plasma sintering** Erica L. Corral, University of Arizona, USA
10:00 – 10:30	Coffee Break
10:30 – 11:00	**Hybrid heated FAST/SPS with additional voltage support** Jan Raethel, Fraunhofer IKTS, Dresden, Germany
11:00 – 11:30	**A dynamic bifurcation criterion for thermal runaway during the flash sintering of ceramics** Joao Gustavo Pereira da Silva, TUHH, Germany
11:30 – 12:00	Coffee Break
12:00 – 12:30	**Hybrid heated FAST/SPS with additional voltage support** Jan Raethel, Fraunhofer IKTS, Dresden, Germany
12:30 – 14:00	Lunch
	Session 7: Techniques, Methods and Simulations–II **Session Chair:** Olivier Guillon, Forschungszentrum Jülich GmbH, Germany
14:00 – 14:30	**Field effects during consolidation of metallic powders** Brandon McWilliams, US Army Research Laboratory, USA
14:30 – 15:00	**Microwave and flash processing of functional materials: Are there (m)any similarities?** Bala Vaidhyanathan, Loughborough University, United Kingdom
15:00 – 15:30	**Flash sintering: New opportunities** Salvatore Grasso, Queen Mary University of London (QMUL), United Kingdom

Thursday, March 10, 2016 (continued)

15:30 – 16:00	**Ceramics sintering and shaping using the electrical field assisted sintering method** Amiya Mukherjee, University of California, USA
16:00 – 16:30	Coffee Break
16:30 – 17:00	**Spark plasma sintering: Comparison between a fully coupled process numerical simulation and experimental data** David Martins, CEMEF / CIRIMAT / SAFRAN, France
17:00 – 17:30	**Growing larger: Scaling up during spark plasma sintering of high–temperature ceramics** Oleg Vasylkiv, National Institute for Materials Science, Japan
17:30 – 18:00	**Energy coupled to matter for field–assisted processing** Raymond Brennan, U.S. Army Research Laboratory, USA
18:00 – 18:30	Coffee Break
18:30 – 19:00	**Energy coupled to matter for field-assisted processing** Raymond Brennan, U.S. Army Research Laboratory, USA
19:00 – 19:30	**Field assisted sintering: Challenges in scale–up from buttons to body armor** Christopher D. Haines, US Army ARDEC, USA
19:30 – 21:30	Banquet followed by Social Hour

Friday, March 11, 2016

07:30 – 08:30	Breakfast
	Session 8: Innovative Materials **Session Chair:** Rolf Janssen, TUHH, Germany
08:30 – 09:00	**Modelling and FEM simulation of electric field assisted sintering of tungsten carbide (WC)** Sree Koundinya Sistla, RWTH–Aachen University, Germany
09:00 – 09:30	**Spark plasma sintering: From the thermal gradient to advanced ceramic composites** Dmytro Demirskyi, Nanyang Technological University, Singapore
09:30 – 10:00	**Densification of dense nano crystalline zinc oxide under electric field** Olivier Guillon, Forschungszentrum Jülich GmbH, Germany
10:00 – 10:30	Coffee Break
10:30 – 11:00	**Features of grain growth and grain boundary formation under microwave and spark plasma sintering conditions** Andrey Ragulya, Institute for Problems of Materials Science (IPMS), Ukraine
11:00 – 11:30	**Fabrication of a vitreous porcelain by conventional sintering and spark plasma sintering** Wirat Lerdprom, Imperial College London, United Kingdom
11:30 – 12:00	**Application of microwave energy to consolidate titanium powder** Christopher Haines, US Army ARDEC, USA
12:00 – 12:30	**Modification of the interdiffusion process in the Fe–Al system by SPS and field assisted sintering** Hanka Becker, Technical University Bergakademie Freiberg, Germany
12:30 – 13:00	**Application of steel as an alternative tool material for field assisted sintering in SPA** Alexander Laptev, Forschungszentrum Julich GmbH, Germany
13:00 – 13:30	**Abnormal grain growth in pressure assisted sintering of $BaLa_4Ti_4O_{15}$** Ana Senos, University of Aveiro/ CICECO, Portugal
13:30	Lunch and Departure

Poster Session

Session Chair: Rolf Janssen, TUHH, Germany

1. **Flash sintering of $SrTiO_3$**
   Fabian Lemke, KIT, Germany

2. **Flash sintering of TCP bioceramics: Effect of particle size and influence on β→α transition**
   Matteo Frasnelli, DII - University of Trento, Italy

3. **FAST sintering of alumina, spinel and yttria-stabilized zirconia three-phase composites**
   David Kok, University of California, Irvine, USA

4.

5. **Fast one-step synthesis and sintering of materials promoted by electric fields**
   Lílian M. Jesus, University of São Paulo, Brazil

6.

7.

8. **Observations on Flash Sintering of Uranium Dioxide**
   Kenneth J. McClellan, Los Alamos National Laboratory, USA

9. **Microstructure and mechanical properties of Spark Plasma Sintered tungsten-copper–zinc composites**
   Thabiso Langa, Tshwane University of Technology, South Africa

10. **Self-organized structure in current-activated pressure-assisted densification (CAPAD)**
    Sebastian Angst, University of Duisburg-Essen, German

11.

12.

13.

14.

15. **Growth behavior of faceted $Na1/2Bi1/2TiO_3$-$BaTiO_3$ grains in single and two-step sintering in support for the microstructural evolution principle**
    Seok-Young Ko, Korea Advanced Institute of Science and Technology (KAIST), South Korea