Program

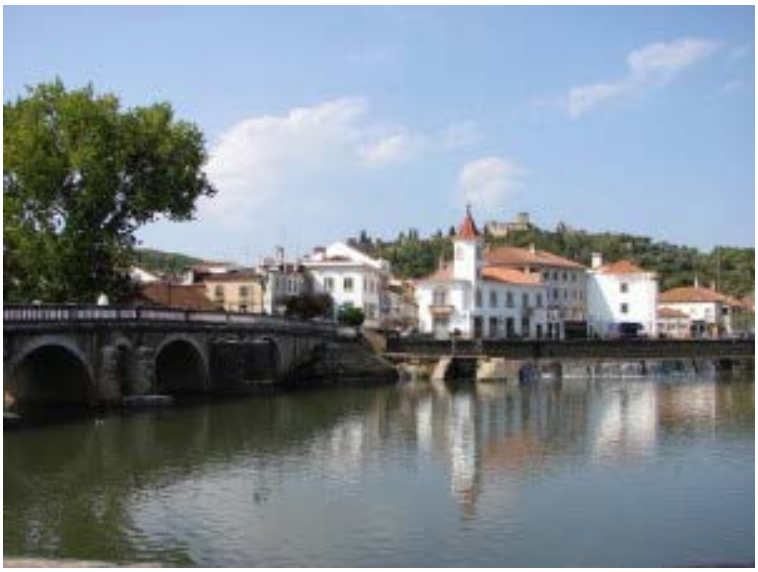
Electric Field Enhanced Processing of Advanced Materials II: Complexities and Opportunities

March 10-15, 2019
Hotel Dos Templarios
Tomar, Portugal

Conference Chairs
Rishi Raj
University of Colorado, USA

Olivier Guillon
Forschungzentrum Jülich, Germany

Hidehiro Yoshida
The University of Tokyo, Japan



Engineering Conferences International
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Engineering Conferences International (ECI) is a not-for-profit global engineering conferences program, originally established in 1962, that provides opportunities for the exploration of problems and issues of concern to engineers and scientists from many disciplines.

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David Pearmain, Lucideon, UK

Haiyan Wang, Purdue University, USA

Anthony R. West, Department of Materials Science and Engineering, Sheffield University, UK

Dietrich Wolf, Department of Physics, University of Duisburg-Essen, Germany

Previous conferences in this series:

Electric Field Assisted Sintering and Related Phenomena Far From Equilibrium
March 6-11, 2016
Tomar, Portugal
Conference Chairs:
Rishi Raj, University of Colorado at Boulder, USA
Thomas Tsakalakos, Rutgers University, USA

Conference Sponsors

Army Research Office

Office of Naval Research Global Office

Sunday, March 10, 2019

16:30 – 18:30	Conference Check-in
18:30 – 19:30	Welcome Reception with music
19:30 – 21:00	Dinner

Locations and Notes

- *Technical sessions will be in the Infante Room. Poster sessions will be in the Convento Room.*
- *Audio, still photo and video recording by any device (e.g., cameras, cell phones, laptops, PDAs, watches) are strictly prohibited during the technical sessions, unless the author and ECI have granted prior permission.*
- *Speakers – Please have your presentation loaded onto the conference computer prior to the session start (preferably the day before).*
- *Speakers – Please leave at least 3-5 minutes for questions and discussion.*
- *Meals: Breakfast is in the Breakfast Room; Lunches and dinners are in the Restaurant.*
- *Coffee breaks are held in the Lobby (unless otherwise announced).*
- *Please do not smoke at any conference functions.*
- *Turn your mobile telephones to vibrate or off during technical sessions.*
- *Please write your name on your program so that it can be returned to you if lost or misplaced.*
- *After the conference, ECI will send an updated participant list to all participants. Please check your listing now and if it needs updating, you may correct it at any time by logging into your ECI account.*
- *Emergency Contact Information: Because of privacy concerns, ECI does not collect or maintain emergency contact information for conference participants. If you would like to have this information available in case of emergency, please place your emergency contact information on the reverse side of your name badge.*

Monday, March 11, 2019

07:30 – 08:30 Breakfast

08:30 – 10:00 ***Topic 1: Manufacturing (SPS, Large Samples, Sinter Forging, Additives)***

Field assisted sintering of larger scaled ceramic parts using adapted tool design and hybrid heating
Martin Bram, Forschungszentrum Jülich GmbH, Germany

Elaboration of complex shapes by spark plasma sintering
Antoine van der Laan, CIRIMAT, Université De Toulouse, CNRS, France

Flash sintering of injection molded zirconia under AC electric field for enhancement of optical properties
Andre L. G. Prette, Lucideon, United Kingdom

Electrical field assisted sintering of yttrium-doped ceria investigated by sinter-forging
Olivier Guillon**,** Forschungszentrum Jülich GmbH, Germany

10:00 – 10:30 Coffee Break

10:30 – 12:00 **Advantages of the method of high-voltage consolidation of powder materials**
Evgeny Grigoryev, ISMAN, Russia

Flash sintering of beta-alumina solid electrolytes for sodium battery applications
Gareth Jones, The University of Warwick, United Kingdom

Topic 2: In-Situ and Ex-Situ Characterization and Methods (X-ray, TEM, Optical, Mechanical)

Electrochemical, optical and thermal effects during flash sintering of 8YSZ
Mattia Biesuz, Queen Mary University of London, United Kingdom

Study of the phase transformation induced by flash sintering in Mn_2O_3 and the investigation of the role of defects in flash sintering using in-situ Raman spectroscopy
Shannon Murray, University of Illinois at Urbana Champaign, USA

12:00 – 12:45 ***Posters Highlights and Visits***

NP-1 **Field Assisted Material Engineering (FAME)**
Mattia Biesuz, Queen Mary University of London, United Kingdom

NP-2 **Hybrid sintering – The beneficial combination of sintering principles**
Juergen Hennicke, FCT Systeme GmbH, Germany

Monday, March 11, 2019 (continued)

NP-3 **Exploitation of industrial application of FLASH to sinter ceramics**
Ricardo Serrazina, University of Aveiro, Portugal

NP-4 **"Fields Matter" initiative in Germany**
Olivier Guillon, Forschungszentrum Jülich GmbH, Germany

NP-5 **Field assisted processing of 3D printed ceramics**
Bala Vaidhyanathan, Loughborough University, United Kingdom

13:00 – 14:30 Lunch

14:30 – 15:45 ***Topic 2 (continued): In situ and ex situ Characterization and Methods (X-ray, TEM, Optical, Mechanical)***

Increase in hardness for flash sintered ceramics
David Kok, University of California, Irvine, USA

In-situ x-ray characterization of phase evolution during solid-state reactions of multicomponent systems
Sanjit Ghose, NSLS II, Brookhaven National Laboratory, USA

Solute-drag vs solute-acceleration during microstructural evolution of alumina
Wayne D. Kaplan, Technion - Israel Institute of Technology, Israel

15:45 – 16:15 Coffee Break

16:15 – 17:15 **Dielectric behavior of FLASH sintered KNN**
Paula M. Vilarinho, University of Aveiro, Portugal

Topic 3: Computational and Analytical (First Principles, Molecular Dynamics, Models, Large Data)

Formation of defect-enriched phases far from equilibrium as a flash sintering mechanism
Malte Jongmanns, University of Duisburg-Essen, Germany

17:15 – 18:00 ***Posters Highlights and Visits***

NP-6 **Influence of 3YSZ sample height at the onset temperature of flash sintering**
João Vitor Campos, University of São Paulo, Brazil

NP-7 **Photoluminescence in SPS-processed transparent Ce:YAG ceramics**
Avital Wagner, Ben-Gurion University of the Negev, Israel

Monday, March 11, 2019 (continued)

NP-8 **In situ measurements of partial discharge patterns on porous YSZ pellets pressed between planar platinum electrodes used for flash sintering**
Jean-Francois Fagnard, University of Liege, Belgium

NP-9 **A novel system for quenching during flash sintering**
Mattan Becker, Technion, Israel

NP-10 **In situ electron microscopy studies of electric field assisted sintering of oxide ceramics**
Danny Schwarzbach, Georg-August-University Goettingen, Germany

NP-11 **Tensile strength of materials obtained by electric pulse consolidation of powders**
Evgeny Grigoryev, ISMAN, Russia

18:00 – 19:00 General Discussion (all hands present)

19:30 – 21:00 Dinner

21:00 – 23:00 Poster Viewing / Social Period

Tuesday, March 12, 2019

07:30 – 08:30 Breakfast

08:30 – 10:00 ***Topic 3 (continued): Computational and Analytical (First Principles, Molecular Dynamics, Models, Large Data)***

Deep learning of CVD growth and phase-transition pathways in layered materials
Rajiv Kalia, University of Southern California, USA

Modeling of Joule heating in KNN FLASH sintering
Ricardo Serrazina, University of Aveiro, Portugal

Thermal runaway, dynamic stability and process control in flash sintering
João Pereira da Silva, Forschungszentrum Jülich, Germany

10:00 – 10:30 Coffee Break

10:30 – 12:00 **Kinetics of liquid-assisted densification during flash sintering of ceramic nanoparticles**
Rachman Chaim, Technion-Israel, Israel

Impedance characterization of calcia-stabilized zirconia as a function of applied field
Julia Ramírez González, The University of Sheffield, United Kingdom

High temperature tensile behavior of zirconia ceramics under DC current
Koji Morita, National Institute for Materials Science (NIMS), Japan

Densification and grain growth kinetics of 3mol% Y_2O_3 stabilized zirconia during flash sintering
Ke Ren, Northwestern Polytechnique University, China

12:00 – 12:45 ***Posters Highlights and Visits***

NP-12 **Microstructure evolution during high-pressure spark plasma sintering (HPSPS) of transparent alumina**
Barak Ratzker, Ben-Gurion University of the Negev, Israel

NP-13 **Impact of an external electric field on grain growth in oxides: Comparison of flash sintered samples to field assisted grain growth**
Jan Preusker, KIT, Germany

NP-14 **Pattern formation during current sintering (Simulation)**
Lukas Engelke, University of Duisburg-Essen, Germany

NP-15 **Microstructural evolution of 3YSZ flash sintered with current ramp control**
Isabela R. Lavagnini, University of São Paulo, Brazil

Tuesday, March 12, 2019 (continued)

NP-16 **Influence of the conformation method on flash sintering of ZnO ceramics**
Ana Storion, University of São Paulo, Brazil

NP-17 **DC electric field assisted 3YSZ ceramic superplastic deformation**
Dianguang Liu, Southwest Jiaotong University, China

13:00 – 14:30 Lunch

14:30 – 15:45 ***Topic 4: Ionic Materials and Glasses (YSZ, Urania, Ceria, Liquid Phase)***

Deformation mechanisms of flash sintered yttria-stabilized zirconia via in situ micromechanical testing
Jaehun Cho, Purdue University, USA

Low temperature and high strain rate superplastic flow in structural oxide ceramics induced by flash event
Hidehiro Yoshida, The University of Tokyo, Japan

The onset of flash sintering 8YSZ
Jinling Liu, Southwest Jiaotong University, China

15:45 – 16:15 Coffee Break

16:15 – 17:15 **Comparison of the electrical and structural properties of flash sintered yttria-stabilized zirconia**
Carolyn Grimley, North Carolina State University, USA

Study of flash phenomena on single crystals of cubic 8 mol% yttria stabilized zirconia
Devinder Yadav, Indian Institute of Technology Patna, India

17:15 – 18:00 **Poster Visits**

18:00 – 19:00 General Discussion (all hands present)

19:30 – 21:00 Dinner

21:00 – 23:00 Poster Viewing and Social Period

Wednesday, March 13, 2019

07:30 – 08:30 Breakfast

08:30 – 10:00 ***Topic 4 (continued): Ionic Materials and Glasses (YSZ, Urania, Ceria, Liquid Phase)***

Electric field induced softening of glass: What can it tell about the mechanism of flash sintering?
Himanshu Jain, Lehigh University, USA

Topic 5: Futuristic Discussion Topics (Heating Rate, Ionic/Electronic, Phonons/Electrons, Interfaces and Electrode Effects)

Reaction flash sintering for producing high quality functional ceramics within seconds
Luis A. Perez-Maqueda, Instituto de Ciencia de Materiales de Sevilla (CSIC-US), Spain

Charged grain boundaries and the microstructural evolution of ionic ceramics
Edwin Garcia, Purdue University, USA

10:00 – 10:30 Coffee Break

10:30 – 12:00 **Enhanced ionic conductivity of 8 mol% yttria stabilized zirconia by flash sintering**
Xavier Vendrell, Polytechnic University of Catalonia, Spain

Local structure and kinetics of defect accumulation in titania flash events
Daniel Shoemaker, University of Illinois, USA

Mixed ionic electronic conductivity and flash sintering
Ilan Riess, Technion, Israel

Metastable nanomaterials and nanocomposites obtained by high-pressure torsion powder consolidation
Stefan Wurster, Erich Schmid Institute of Materials Science, Austria

12:00 – 12:45 ***Posters Highlights and Visits***

NP-18 **Field-induced mass transport phenomena in flash sintered high temperature ceramics explored by in situ SEM and TEM**
Jaehun Cho, Purdue University, USA

NP-19 **Flash sintering of ceramic films: The influence of surface to volume ratio**
Viviana Avila, University of Colorado Boulder, USA

NP-20 **Transition to partial electronic conductivity at the onset of flash measured by in-situ impedance spectroscopy**
Seohyeon Jo, University of Colorado Boulder, USA

Wednesday, March 13, 2019 (continued)

NP-21 **In-situ measurements of the elastic modulus of zirconia polycrystals held in a state of flash induced by an electric field**
Rishi Raj, University of Colorado Boulder, USA

NP-21A **Current rate flash of carbon fibers**
Rishi Raj, University of Colorado Boulder, USA

NP-22 **Unusual atom displacements in TiO_2 during flash sintering**
Bola Yoon, University of Colorado Boulder, USA

NP-23 **Powders of four elemental oxides transformed and sintered by reactive flash**
Viviana Avila, University of Colorado Boulder, USA

13:00 – 14:30 Lunch

14:30 – 19:00 Excursion - Guided tour of the Convento de Cristo (a UNESCO World Heritage Site), Tomar's most famous landmark. The Convento is on a hill overlooking town, within easy walking distance of the hotel. The Convento combines architectural styles from the 12th through 17th centuries. An ornate octagonal canopy protects the high altar of the Templo dos Templares, modeled after the Holy Sepulchre in Jerusalem. The grounds of the convent contain eight cloisters embracing a variety of styles. After the Convento de Cristo, the tour will continue in the historic area of Tomar.

19:30 – 21:00 Dinner

21:00 – 23:00 Poster Viewing and Social Period

Thursday, March 14, 2019

07:00 – 08:30 Breakfast

08:30 – 10:00 ***Topic 5 (continued): Futuristic Discussion Topics (Heating Rate, Ionic/Electronic, Phonons/Electrons, Interfaces and Electrode Effects)***

Some observations on the response of oxides to an applied field
Anthony West, University of Sheffield, United Kingdom

Topic 6: SPS and Microwave (Common Themes, Linkage to Flash)

Ultra-rapid microwave sintering of ceramics and powder metals
Kirill I. Rybakov, Russian Academy of Sciences, Russia

Effective colloidal processing for densification before SPS
Tohru S. Suzuki, National Institute for Materials Science, Japan

10:00 – 10:30 Coffee Break

10:30 – 12:00 **The role of defects in microwave-assisted synthesis of cubic ZrO_2**
Nathan J. Nakamura, Carnegie Mellon University, USA

Electric field assisted densification of 10 mol% gadolinium doped ceria (GDC 10)
Tarini Prasad Mishra, Forschungszentrum Jülich GmbH, Germany

Some strategies to (co)-sinter refractory functional oxides at low temperature by spark plasma sintering
Catherine Elissalde, ICMCB/CNRS, France

Cool-SPS: Pulling down the temperature, pushing up the reactivity
Michaël Josse, Université de Bordeaux, ICMCB, France

12:00 – 12:45 ***Posters Highlights and Visits***

NP-24 **Lattice softening**
Rishi Raj, University of Colorado Boulder, USA

NP-25 **A short review of FS mechanisms**
Yoed Tsur, Technion, Israel Institute of Technology, Israel

NP-26 **β-SiAlON-based ceramic composites by combustion synthesis and spark plasma sintering**
Evgeny Grigoryev, ISMAN, Russia

NP-27 **Evidence for microstructure-dependent hysteresis in SCO molecular ceramics prepared by cool-SPS**
Liza El Khoury, ICMCB/Bordeaux University, France

Thursday, March 14, 2019 (continued)

NP-28 **W-Cr solid solution: Comparison of alloying in SPS and by ball milling**
Monika Vilémová, Institute of Plasma Physics AS CR, v.v.i., Czech Republic

NP-29 **Flash joining of graphite with polymer derived ceramic interlayer**
Mattia Biesuz, Queen Mary University of London, United Kingdom

13:00 – 14:30 Lunch

14:30 – 15:45 ***Topic 6 (continued): SPS and Microwave (Common Themes, Linkage to Flash)***

Grain growth behavior during spark plasma sintering of ceramics
Byung-Nam Kim, National Institute for Materials Science, Japan

Topic 7: Metallic, Conductive and Non-Oxides (Metals, Semiconductors, Carbon)

Densification of NdFeB magnets by electro-discharge sintering - Microstructure, mechanical and magnetic properties
Lennart Leich, Ruhr-Universität Bochum, Lehrstuhl Werkstofftechnik, Germany

Electrical-field assisted flash joining of ceramic oxide-ceramic oxide and ceramic oxide-metal
Yiguang Wang, Beijing Institute of Technology, China

15:45 – 16:15 Coffee Break

16:15 – 17:15 **Flash sintering of armor materials: Challenges and opportunities**
Andrew Rosenberger, Army Research Laboratory, USA

Effect of the addition of doped-cobalt on the properties of recycled tungsten carbide powder sintered by SPS
Alexandre Mégret, University of Mons, Belgium

17:15 – 18:00 ***Poster Highlights and Visits***

NP-30 **The effect of high current densities on iron-carbon alloy thin films**
Thomas Brede, Institute of Materials Physics, Germany

NP-31 **Effect of electric current annealing in phase transition of Mn-Al alloy**
Fernando Maccari, Technical University of Darmstadt, Germany

NP-32 **Insights into reactive flash sintering of MgO-Al_2O_3-(8YSZ) by in-situ synchrotron X-ray diffraction**
Bola Yoon, University of Colorado Boulder, USA

Thursday, March 14, 2019 (continued)

NP-33 **Flash sintering of zirconia/alumina powders**
Rebecca O'Toole, University of Colorado Boulder, USA

NP-34 **The influence of carbon on the microstructure of sintered alumina**
Rachel Marder, Technion- Israel Institute of Technology, Israel

NP-35 **Densification of classic and fragile ferroelectrics by Cool-SPS**
Flora Molinari, ICMCB-CNRS, Université de Bordeaux, France

NP-36 **Eutectic microstructures by flash sintering**
Martha Mecartney, University of California, Irvine, USA

18:00 – 19:00 General Discussion (all hands present)

19:30 – 21:30 Gala Dinner

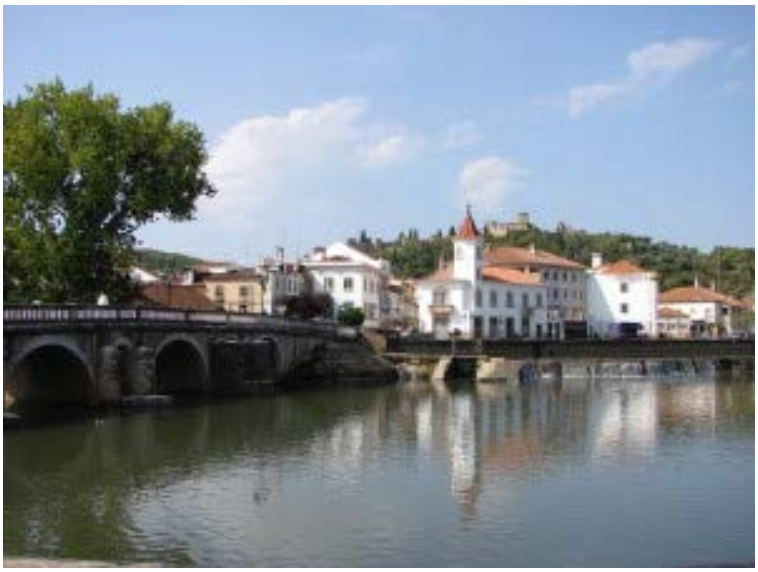
21:30 – 23:00 Poster Viewing and Social Period

Friday, March 15, 2019

07:30 – 08:30	Breakfast
08:30 – 09:00	Discussion of Future Meetings and Community Building Activities
09:00 – 10:30	***Topic 7 (continued): Metallic, Conductive and Non-Oxides (Metals, Semiconductors, Carbon)***
	Anomalous twinning in AZ 31 magnesium alloy during electrically assisted forming Franz Körkemeyer, Institut für Werkstoffkunde, Leibniz-Universität Hannover, Germany
	Evidence of localized, incipient melting during field-assisted sintering of oxide dispersion strengthened, nanocrystalline metals Sean J. Fudger, US Army Research Laboratory, USA
10:30 – 11:00	Coffee Break
11:00 – 12:30	***Topic 8 (continued): Complex Ceramics (Energy, Functional, Structural, Optical)***
	Triggering the catalytic activity of $SrTiO_3$-based ceramics by flash sintering Simone Mascotto, University of Hamburg, Germany
	Atmosphere assisted FLASH sintering of KNN Ana Senos, University of Aveiro, Portugal
	New and ongoing research activities in Boulder Rishi Raj, University of Colorado, USA
12:30	Lunch and departures

Posters

Electric Field Enhanced Processing of Advanced Materials II: Complexities and Opportunities



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Poster Presentations

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