For this time, OZ-15 has joined together with the
„International Workshop on Functionalization and Applications of Soft/Hard Materials (Soft/Hard 2015)“

8th German-Japanese Symposium on
8th International Symposium on
nanostrucutures

Dear colleagues and dear All,

This is the 8th German-Japanese | 8th International Symposium on Nanostructures OZ-15.

We are now meeting for the fourth time in Japan and still we are focussing on making things smaller and increasing function and benefit at the same time.

Making more with less will determine our all success in being able to satisfy increased demands of more people still with the same not-growing resources. An intelligent design of materials, processes and products also decides if we will be successful in changing our entire economies to fully recycle-able ones. There is no waste on this
planet ! There is material !

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For the second time, nanoTruck is coming to OZ and insofar many thanks to the German Federal Ministry of Education and Research. In the outside area this time we will see numerous zero emission vehicles and inside quite a large electrolyser. The ceremonial lecture this time will be an experimental one demonstrating a levitating monorail and one address will show us how to fly electrically - which may all show us how important mobility and likewise how important energy is becoming in our understanding of future - our all future.

And not a standard phrase but very much again we like to say “thank you very much!” to those, who made all this possible: our oral and poster speakers, our exhibitors and our attendees and last but not least at all, the diligent OZ-team and helping hands on site.
Let’s start another global brainstorming to the benefit of mankind and planet.

Domo arigatto, danke schoen and thank you very much.

Kei Ameyama & Henning Zoz

RITSUMEIKAN

Zoz Group

The event is organized by
Zoz Group & Ritsumeikan University

and mainly financed by the Ritsumeikan Global Innovation Research Organization (R-GIRO) Project and the Grant-in-Aid for Scientific Research on Innovative Area, “Bulk Nanostructured Metals”, through the Ministry of Education, Culture, Sports, Science and Technology, Japan (MEXT), Japan.

The Ritsumeikan Global Innovation Research Organization (R-GIRO) Project:
http://www.ritsumei.ac.jp/eng/html/research/

and the Grant-in-Aid for Scientific Research on Innovative Area, “Bulk Nanostructured Metals”, through MEXT, Japan:
http://www.bnm.mtl.kyoto-u.ac.jp/

Bulk Nanostructured Metals

Japan Science and Technology Agency

CEEJA Centre Européen d'Études Japonaises d'Alsace

OZ-venue in Japan, Nagakawa Building, RITS Suzaku Campus
Kyoto, Japan

OZ-venue in Germany, the Wenden townhouse
Wenden, Germany

History of Industry in Kyoto

Deemed the capital of Japan In 794, Kyoto became the center of the politics, economy and culture for the approximately 1100 years that would follow. Kyoto is a historical city that has played a large role in enriching Japanese culture over a long period of time. Particularly because it has not experienced any turmoil since the Onin War of 1467, nobles dominated the society in Kyoto and the profound culture was able to thrive. Artisans gathered from all over the country, and the dynasty culture blossomed in fields such as architecture, painting, sculpture, textiles, dyeing, gold or silver lacquer, pottery, porcelain, and lacquerware. This formed the basis of Kyoto-style craftsmanship, and gave birth to the drive towards sophistication, originality and distinctiveness.

As time passed, a wide variety of venture companies arose out of the artisan culture which had supported the arts and crafts. For example, one store that used to make gold leaf for gold and silver threads for Nishijin-brocade and lacquerware for more than 300 years was transformed into a high-tech company called Fukuda Metal Foil & Powder Co., LTD. Shimadzu Corporation, a manufacturer of instruments for physics and chemistry during the Meiji era, grew to become one of the leading-edge companies for scientific analysis. In 2002, Dr. Koichi Tanaka, one of the researchers at the company, received the Nobel Prize in Chemistry. In fact, high-tech companies such as the Kyocera Corporation and Murata Manufacturing Co., Ltd. started their businesses as pottery and porcelain manufacturers, which are traditional industries in Kyoto. World-renowned Nintendo Co., Ltd. and other Entertainment companies were established in Kyoto as well.

Kyoto is a unique city where the high-tech industry coexists with the historical culture and traditional industry. While Kyoto is home to many chip makers and electronics companies, it has also established traditional industries such as Nishijin-brocade, Kyo-Yuzen dyed fabrics, Kiyomizu ware and articles used for Buddhist altars.

The strong foundation of history and culture found in Kyoto has been one of the key factors in producing creative venture businesses and companies. The numerous universities and colleges in Kyoto proactively offer their research achievements and know-how to the companies which have, in turn, provided a high degree of support for technology innovation. As one of these dedicated educational institutions, Ritsumeikan University has continued its efforts to advance its leading-edge research, reinforce collaborative efforts between Government, Industry, and Academia, and contribute to the development and support of venture businesses.

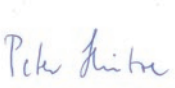
Address for the 8th German-Japanese | 8th International Symposium on Nanostructures, March 1-3, 2015, Kyoto, Japan

Nanotechnology is a key technology of the 21st Century. It comes with great opportunities for the development of innovative materials and processes. More than any other technology field, nanotechnology is an interdisciplinary technology, that is applied in a large variety of product areas. E. g. I am thinking about future fields like energy and climate change, health, mobility and communication. By achieving nanostructure, materials can be optimized, processes simplified and cost can be reduced. These opportunities must be exploited. Today, Germany is already the leader in nanotechnology in Europe. This we owe many highly innovative companies and a powerful research environment. This lead, Germany has to secure and expand. As an exports nation, our country is reliant to continue being a technology-pacemaker. Only on such strategy Germany maintains its global competitiveness and German companies can open up new markets.

For this reason, nanotechnology is an integral part of the high-tech strategy of the German government. The aim of the "Nanotechnology Action Plan 2015" is to exploit the potential of nanotechnology for economic growth, to make nanotechnology safe and sustainable, to utilize its potential in education and research and to provide an important contribution for addressing global challenges such as climate protection with nanotechnology. A major concern is to ensure sufficient public acceptance.

In particular medium-sized enterprises are very successful in nanotechnology. With their creativity, they are often pioneers for important technological leaps. Nanotechnology is reliant on interdisciplinary exchange and international cooperation. I therefore welcome that Zoz Group with its partners in Japan is discussing frequently and as part of the German-Japanese / International Symposium on Nanostructures current issues of this fascinating technology. The symposium can make an important contribution to scientific and technical progress in the nanotechnology sector.

Wishing all of you a successful meeting in Japan,



Peter Hintze,
Vice President of the German Parliament

Address for the 8th German-Japanese | 8th International Symposium on Nanostructures, March 1-3, 2015, Kyoto, Japan

The Airbus Group considers the application and the research on nanotechnologies as having a huge potential to improve products and processes of our Divisions.
New environmental friendly and economical processes for treatment and structuring of surfaces, new sensors and new materials or better to say „material systems“ which integrate different physical properties are only a part of the areas of application which our researchers investigate together with our partners.

Nanomaterials will enable properties of mechanical, electrical and electronic components as well as fluids which we cannot yet imagine today.

The 8th German-Japanese International Symposium on Nanostructures is an event where ideas on today's and future applications on nanotechnologies can be developed for the benefit of society and economics.

In this sense I wish to all participants a successful symposium.

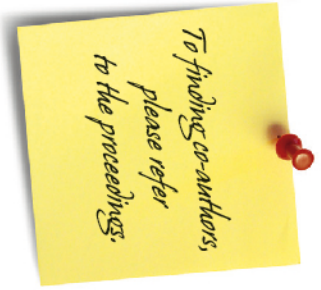
With best regards,
sgd.
Dr. Jean Botti

Dr. Jean Botti
Airbus Group Chief Technical Officer (CTO)
Member of Group Executive Committee

AIRBUS
GROUP

Schedule

time/day	**Sunday, March 01** arrival day	**Monday, March 02** OZ-15 | day 1	**Tuesday, March 03** OZ-15 | day 2	**Wedensday, March 04** OZ-15 excursion
location	Registration Welcome and Reception	conference site	conference site	industry tour, and excursion
08:00				
09:00				Leave Hotel, trip
10:00		Openning adress and Ceremony	session 4	
11:00		session 1	coffe-break	Fukuda Shiga Plant
12:00		coffe-break	session 5	lunch and trip
13:00		session 2	lunch	
14:00		lunch		
15:00		session 3	session 6	Nara / Todaji Temple World Heritage Region
16:00		coffe-break	coffe-break	
17:00	Welcome and Reception	Poster short Presentation	Poster Ession, Exhibition and Coffe	trip back to hotel
18:00			Closing Remark, Poster Award	
19:00			Banquet	
20:00				
21:00				



8th German-Japanese | 8th International

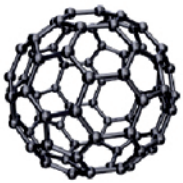
Symposium on nanostructures

Presentations

auditorium

NANOPOLYMER
Russian Polymer Company

FULLERENES



fullerene soot
sublimed C60
buckyballs C60
(higher) fullerene mixture

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Monday, March 02

Welcome Session | 9:30 - 10:00

W01 **[Welcome to OZ-15]**

Ritsumeikan University
Japan

Prof. Dr. Kei Ameyama
Vice Dean

Zoz Group
Germany

Prof. Dr. Henning Zoz
President & CEO

W02 **[Welcome to Japan]**

Embassy of Germany
Japan at Tokyo

S. E. Dr. Hans Carl von Werthen
Ambassador of Germany in Japan

W03 **[Welcome to Japan & Germany]**

German Research and Innovation Forum Tokyo
(DWIH Tokyo)

Regine Dieth
Director

V01
S01

Hanyang University - ERICA Campus
Department of Metallurgy and Materials Science
Seoul, Korea

Prof. Dr. Jai-Sung Lee
National Academy of Engineering of Korea,
Past President of KPMI

Advances in PM Nanomaterials Processing

Powder Metallurgy (PM) processing of nanoscale metal powders has been of great interest in that it can realize fabrication of high performance PM material parts with saving process-energy as well as using cost effective materials. Among many expecting properties of PM materials the grain refinement relating material properties are important. However, these hopeful expectations are only possible when proving the following requirements are fulfilled; 1) cost-effective metal nanopowder, 2) feasibility of nanopowder processing by conventional PM process, 3) shaping and compaction, 4) homogeneity in sintering consolidation and fine microstructure. Among these prerequisite demands the compaction or shaping of nanopowder is the most difficult issue in processing PM nanomaterials by conventional PM technology. There have been so far great efforts for solving this problem by conventional or novel PM technologies. However, there is not yet reported on achieving relevant properties of metal nanopowders.
In this presentation our current researches on finding a breakthrough PM technology by controlling nanopowder structure are introduced. The key idea of the researches is based upon the optimization of structure design and full density processing of intrinsic- or extrinsic type bimodal nanopowders into bulk nanostructured material components. Especially understanding the roles of hierarchical interfaces in nanopowder agglomerates on full density nanopowder materials by pressureless sintering is stressed.

V02
S01

Japan FC Planning Co., Ltd.
Japan

Dr. Michio Hori
Chairman of the Board

Current Situations and Future Tasks of PEMFC for Automobile Use

In Japan, TOYOTA Motor Corp. started selling the FC Vehicles "MIRAI (Future)" powered by the proton exchange membrane fuel cells (PEMFC) and the constructions of hydrogen stations began proceed in earnest. PEMFC's research programs of New Energy and Industrial Technology Development Organization (NEDO), which had started more than 20 years ago, will complete the remaining five years. And under these circumstances, in Japan, PEMFC's researches have been changing from the stage of material basic research to the stage of practical development. In this presentation, I will introduce several topics on the development situations of FC Vehicles, the situations of PEMFC's basic research and the situations of practical development of the PEMFC's parts and production facilities.

V03
S01

National Institute of Advanced Industrial Science and Technology (AIST)
Japan

Dr. Tomonari Takeuchi
Senior Researcher

Application of Spark-Plasma-Sintering Process for Fabricating Sulfur-Based All-Solid-State Batteries

Lithium sulfide (Li2S) is one of the promising cathode active materials for high energy rechargeable lithium batteries because of its high theoretical capacity (ca. 1170 mAh・g-1). However, Li2S is both electronically and ionically resistive, which gives rise to low active material utilization in the cells. In order to enhance the conductivity of Li2S, several attempts, such as forming composites with carbon (Li2S-C), have been performed [1,2]. Recently, these Li2S-C composites have been applied to positive electrode in all-solid-state cells with indium anode and sulfur-based solid electrolyte (SE), and showed relatively high specific discharge capacity of ca. 700 – 900 mAh・g-1-Li2S (normalized by Li2S mass) [1,2]. Alternating In anode to graphite is one of the effective approaches to improve the energy density of the cells [3,4]. In the present work, we tried to fabricate graphite/SE/Li2S all-solid-state cells by applying the spark-plasma-sintering (SPS) process. Commercially available graphite was blended with SE(Li7P3S11) in a 6 : 4 weight ratio, and the mixture was then treated by the SPS process to yield the graphite-SE composite. The obtained composite sample was characterized by XRD, S K-edge and P K-edge XAFS (SR Center, Ritsumeikan University) measurements. The all-solid-state cells were assembled using the graphite-SE composite anode, SE, and Li2S-C cathode [3,4]. The electrochemical measurements were carried out at 30oC at current densities of 11.7 – 233 mA・g-1-Li2S (corresponding to 0.01 – 0.2 C) between 0.5 and 3.5 V.

V04
S01

Zoz Group
Zoz GmbH
Germany

Tom Zoz
Assistant to the President

FuturBeton – high sustainability by nanostructured ground granulated blast furnace slag

FuturBeton is HPC made from FuturZement which contains highly reactive Ground granulated blast furnace slag (GGBS) obtained from high kinetic processing (HKP) by Simoloyer®. GGBS is latent hydraulic and often used as cement additive. The low reactivity limits the use of GGBS-cements because of a low initial strength. The hydraulicity of GGBS increases significantly by HKP and causes a high initial strength of FuturBeton. The resulting dense structure causes a better durability. Global 3.6 bio.t/a cement are produced which causes 5% of all anthropogenic CO2. Therefore the reduction of cement and clinker therein is essential. Up to 120 kg/t of emitted CO2 can be saved by application of FuturZement with improved properties compared to Portland Cement. HP-GGBS has been investigated in a research project of the German ministry of education and research (No. 03X0068) resulting in the construction of a public bridge containing 15 t of HP-GGBS.

V05
S02

Korea Magnesium Technology Research Association
Korea

Dr. Min Cheol Kang
Executive Director

The Strategic Opportunities of Magnesium for a Light Metal Age.

The consumption and applications of magnesium alloys have significantly increased during the last several years in the world. The amount of magnesium alloys ingots remarkably increased with the increase in their applications to information technology components and automobile parts recently. This presentation outlines the recent progress on the magnesium industries, applications, fabrications, and researches in Korea.
The total demand for magnesium primary ingots was 27,220 tons in 2013. 65% of the consumption of magnesium alloys was used to produce electronic parts in Korea. IT components using magnesium alloys include various types of cases for 3C (cameras, computers, and communications) parts, LED heat sink and medical devices, etc. The applied magnesium components for automobiles are steering wheel core, steering column bracket and head lamp housing etc. In addition, research and developments to produce engine block, oil pan, and transmission case using creep resistant magnesium alloys have been conducted.
The magnesium industry in Korea has been mainly focused on the production of die-casting components to dates. However, press forming products are expected to increase soon or later because POSCO started mass production of magnesium sheets and plates via Twin-Roll Strip Casting process in 2007. POSCO has succeeded to fabricate strips with a width of up to 2000mm using the same process, which increased the possibility for applying magnesium sheets to large automobile components. The extrusions such as bars, tube, and shapes have been produced as well using a billet fabricated by a semi-continuous casting process.

V06
S02

Daikin Industries, Ltd. Chemical Research & Development Center
Japan

Dr. Takabumi Nagai
Researcher

N-Phenyl-substituted Fulleropyrrolidine Derivatives for High Performance Organic Photovoltaics

Organic photovoltaic (OPV) cells have attracted a great deal of attention because OPV has great advantages such as flexibility, lightweight, and low cost of large-volume manufacturing. In the last decade, the great development of donor materials contributed to the improvement of OPV performances. However, research efforts for acceptor materials of OPVs are dominated by the use of [6,6]-phenyl C61 or C71 butyric acid methyl ester (PCBM). For industrial production, it is necessary to produce of new candidate material that can mass-produce with low cost. This time, I'd like to talk about our developed fullerene derivatives as an acceptor material for OPV. The OPV devices fabricated using our original fullerenes with poly(3-hexylthiophene) (P3TH) or a low-bandgap polymer as a donor material exhibited good power conversion efficiency (PCE). These results show our fullerenes have potential as useful acceptor for OPVs.

V07
S02

Sorbonne Paris Cité Confederal University
France

Prof. Guy Dirras
Group Leader

Ultrafine-grained Aluminum processed by a Combination of Hot Isostatic Pressing & Dynamic Plastic Deformation: Microstructure & Mechanical Properties

Commercial-purity (99 wt pct), bulk, ultrafine-grained aluminum samples were produced by a two-step process that combines powder consolidation by hot isostatic pressing and dynamic plastic deformation (DPD). The compaction step yielded crystallographic texture-free specimens with an average grain size of approximately 2 ?m. Then, some of the consolidated specimens were deformed dynamically at room temperature at an initial strain rate of 370 s-1 and up to an axial strain of e = 1.25. After dynamic plastic deformation, the grain size and the dislocation density were approximately DTEM =500 nm (DXRD = 175 nm) and 1014 m-2, respectively. The yield strength was approximately 77 MPa for the as-consolidated sample, which increased up to approximately 103 MPa and 120 MPa for the impacted samples along the axial and radial directions, respectively. The compression stress as a function of strain showed saturation behavior for the axially deformed samples, whereas the specimens deformed along the radial direction exhibited significant strain softening. The latter behavior is explained mainly by the weakening of the crystallographic texture that occurred because of the strain-path change along the radial direction. Other example of grain refinement using one step DPD of coarse-grained materials such as CP-Ti, Ni and Zn will be discussed.

V08
S02

Zoz GmbH
Zoz Technology Center
Germany

Deniz Yigit
Head of R&D Division

EU-Project Bor4Store: Development of a Boron Hydride based integrated SOFC – Metal Hydride Tank System

In the frame of the FCH JU (Fuel Cells and Hydrogen Joint Undertaking) project BOR4STORE – "Fast, reliable and cost effective boron hydride based high capacity solid state hydrogen storage materials" (grant 303428), a metal hydride tank containing ca. 10 kg of a boron hydride based storage material and storing ca. 1 kg of hydrogen shall be thermally integrated with a high temperature solid oxide fuel cell (SOFC). Factors like required hydrogen flow for the SOFC at maximum power level, electric efficiency, fuel consumption, reaction kinetics and engineering and safety requirements lead to a tank design, where the heat from the SOFC exhaust gases is transferred via a heat exchanger system to the metal hydride tank. The complete system will be set up in 2015 and tested for verification of the concept and stability of the hydrogen storage capacity during cycling.

V09
S02

Fraunhofer Institute for Manufacturing Engineering and Automation (IPA)
Germany

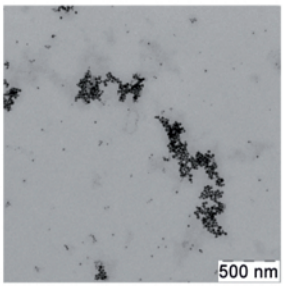
Dipl.-Ing. - Raphael Neuhaus
Project Manager

Nanocarbons in supercapacitor electrodes – an approach to foster nanotechnology in electric power trains

To compete with conventional vehicles on the market, electric vehicles require high-performance rechargeable energy storage systems ideally equipped with high energy and power density, cost-efficiency, long lifetimes, extraordinary reliability and safety as well as minimal environmental impact. The last decades have triggered an increasing interest in capacitive energy storage, an electrical storage mechanism found in electrochemical capacitors (ECs), which allows ultrafast charging and discharging. Research driven improvements in efficiency and reduction of costs led to the use of ECs in electric vehicles, but exploiting nanocarbons for EC electrodes is still an essential field of research around the globe. The presentation provides a short overview of Fraunhofer IPAs activities in EC development focusing on new materials and manufacturing techniques for EC electrodes. Points addressed in current research projects are pore size distribution, size of electrolyte ions, wettability of the material surface structure for optimized pore fillings and the accessibility of the micro- and nano-pores, respectively. Increasing the di-electric strength of the electrolytes and raising the conductivity of the electrode nanostructure also has a strong leverage effect on energy and power density. It is very important to adjust the elements of electrochemical capacitors to each other in order to achieve the best performance.

NANOMET

Colloidal Metal Nanoparticles



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Mob. +7 963 916 3220
Mob. +49 171 915 6337
Email: darya@nanomet.ru

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V10
S03

University of Paris XIII
Laboratory of Science of Processes and Materials
France

Dr. David Tingaud
Assistant Professor

Mono- and bi-modal Nickel processed by SPS or combination of CIP+SPS: characterization and comparison

One strategy to solve the dual problem of improving both the strength and the ductility of nano- or ultrafine-grained materials deals with the incorporation of a fraction of micron-sized grains in an ultrafine-grained matrix as these micron-sized grains are more able to plastically deform and store dislocations during straining. The bi- or multi-modal microstructures can be achieved by either heterogeneous grain growth following severe plastic deformation [1, 2] or in a more controlled way by using powder metallurgy (PM) routes [3, 4]. In the present work nickel samples were elaborated by PM using a first possible densification step performed by Cold Isostatic Pressing (CIP) [5] up to 1100 MPa followed by Spark Plasma Sintering (SPS). The obtained dense microstructures were made of either monomodal grain size distributions (made of only micrometer or ultrafine (< 1µm) grains) or multimodal grain size distribution with a controlled volume fraction of ultrafine and micrometer-sized particles. The microstructures of the samples processed directly by SPS or by a combination of CIP/SPS were characterized by electron microscopy techniques ant their mechanical properties have also been evaluated through compression tests. Prior to compression, the investigations show high densities of high-angle grain boundaries (HAGB), with a clear majority of them around 60°, related to Σ3 type boundary, comprising coherent twin boundaries. When compressive strain increases moderately, the dramatic reduction of the 60°-GB fraction gradually avails the low-angle grain boundary (LABG) fractions to grow. The effect of the different microstructures (CIP/SPS and SPS) and their evolution upon straining on the macroscopic mechanical behaviour will be discussed.

V11
S03

University of Trento
Department of Industrial Engineering
Italy

Dr. Cinzia Menapace
Researcher

Nanostructured copper produced via mechanical milling and Spark Plasma Sintering

Two different copper powders, a commercial one and a high purity one having a different oxygen content, were mechanically milled and consolidated through SPS (Spark Plasma Sintering) in order to obtain a nanostructured material. The influence of the initial oxygen content on the milling as well as on the further sintering process was studied. The presence of oxides reduces the milling time because of the cutting ability of the hard oxides particles to fragment the copper powder. The evolution of the ball milled powder (particles morphology and size, grain size, microstrain) with the milling time was studied and the powders were characterized through metallography (optical, SEM), X-Ray and thermal analysis. Thermal analysis, i.e. DSC (Differential Scanning Calorimetry) coupled with Mass Spectroscopy was used in order to detect the evolution of gases during the heating of the powders. Gaseous products are mainly due to the decomposition of stearic acid residues added to the copper powder as PCA (Process Control Agent). Thermal analysis data were correlated to SPS curves leading to understanding the sintering process and to set up the most proper parameters to improve the sintering cycle. The mechanical properties of the SPSed samples were influenced by the presence of oxide particles and a high quantity of submicrometric/nanometric pores, which should be reduced in order to obtain a satisfying ductility.

V12
S03

Ritsumeikan University
Ameyama Lab
Japan

Dr. Sanjay Kumar Vajpai
Senior Researcher

Development of High Performance Structural and Functional Materials through Innovative Microstructural Designing and Processing Strategies

In recent decades, continuous research efforts have been made to improve performance of structural and functional materials, wherein the microstructural characteristics were found to play an important role in the development of high performance materials. In particular, creation of unconventional and novel microstructures demonstrated considerable improvement in the mechanical properties, such as strength and toughness, of a variety of structural and functional materials. For example, bulk structural materials with bimodal grain size distribution exhibited considerably higher strength and toughness as compared to their homogeneous fine/coarse - grained counter parts. Similarly, in case of multi-phase materials, the size and spatial distribution of different phases also play an important role in defining the final properties. However, these objectives cannot be achieved without developing a suitable processing strategy to prepare bulk materials with such strictly controlled microstructures. Since processing is material specific, it is also an important issue which requires equal attention. Therefore, a holistic approach, consisting of innovative microstructural designing and suitable processing strategies, holds the key to develop high performance materials.

V13
S04

University of Gothenburg
Department of Physics
Sweden

Prof. Dr. Lachezar Komitov
Head of Liquid Crystal
Physics Group

A New Generation of Materials for Nano-Structured Alignment Layers in LCDs

The uniform liquid crystal alignment in conventional LCDs is achieved by means of a very thin organic layer deposited onto inner surface of the confining solid substrates. The material, the alignment layer is made of, plays a very important role for the properties as well as for the quality of liquid crystal alignment. In the conventional LCDs, the alignment layer is made usually from polyimide material, which is well known as a material promoting uniform and highly stable with temperature and time liquid crystal alignment. However, the preparation of alignment layers made from polyimides is energy demanding process since it requires curing at high temperatures. Nano-structured alignment layers made from a new generation of side-chain polymers will be presented in this talk. The preparation of such kind of alignment layers do not require any curing, i.e. hight temperature processing, and therefore these new alignment materials are proper candidates for LCDs with flexible substrates, which is considered as the next generation LCDs. Materials for vertical, planar and tilted alignment as well as for photoalignment, which properties are comparable or even better than those of polyimides, will be reviewed.

V14
S04

Argonne National Laboratory
Electron Microscopy Center
USA

Dr. Arnaud Demortiere
Materials Scientist

Zig-zag Self-assembly of magnetic Octahedral Fe_3O_4 Nanocrystals using in situ Liquid Transmission Electron Microscopy

Direct imaging of colloidal nanoparticles solution by liquid phase transmission electron microscopy enables unique in situ study of nanocrystal self-organization and offers a great opportunity to improve understanding of fundamental mechanisms governing self-assembly at nano-scale. In equilibrium, different aspects of self-assembly can be described in term of thermodynamics of interacting particles. However, out of equilibrium, long-range hydrodynamic interactions play also an important role in the process and expected to become more significant, as for instance, in charged solvent media with electrophoresis effect. Real time/nanoscale capable instrumentation is needed for the successful design of large-scale particles arrays suitable for effective device architectures. Since the size domain of nanoparticle self-assembled lattices is below the diffraction limit of visible light, the X-ray scattering techniques, such as SAXS and GISAXS have been used as being the best tool in the study of the superlattice growth (in situ or ex situ) at liquid/air and liquid/substrate interfaces. However, nanoscopic details remain elusive during the super-cluster formation, such as particle dynamics, surface re-building, re-arrangement effect, and relative position. The latest developments in liquid cell TEM technology opens up a new window for in situ study at nanoscale.

V15
S04

Ecole Normale Supérieure de Cachan
PPSM, Institut d'Alembert
France

Dr. Pierre Audebert
Team Leader

Electrofluorochromic switching of redox fluorophores; the case of triarylamines and tetrazines.

Electrofluorochromism is the reversible redox switching of fluorescent molecules or polymers. It can proceed through either direct conversion of the fluorophores, or through indirect conversion of a fluorophore partner, triggering an electron transfer inducing extinction or recovering of fluorescence. This property has been studied especially in the case of a triarylamine, and some selected tetrazines. The triarylamine below (Fig. 1) has been found to display up to four different stable redox states, two being fluorescent. Tetrazines, in association with an imide, have been used to realize three-colors switchable displays. All these features will be presented and detailed throughout.

V16
S05

Kunming University of Science and Technology (KUST)
China

Dr. Changjiang Yang
Associate Professor

Carbon nanotube enhanced Pb anode for zinc electrowinning

Pb usually was used as the oxygen evolution anode for zinc electrowinning over one century. carbon nanotubes enhanced Pb (CNTs-Pb) anode was fabricated by electrocoposition assisted with ultrasonic, which showed excellent electrochemical behaviors during the oxygen evolution process. The overpotential of oxygen evolution of carbon nanotube enhanced Pb anode was 200mV lower than that of Pb anode due to the high electroconductibility of CNTs and large activity area. The anti-corrosion of carbon nanotube enhanced Pb anode was also increased which indicated a long life in industry. The hardness was 49.1 HV, which was about 4 times higher than that of Pb plate(12.5HV), suggesting the less deformation of CNTs-Pb anode.

V17
S05

Analytical Tribology Network (ATN)
Germany

Dr. Ullrich Gunst
Director

Imaging and Characterization of System Surfaces and Tribologically Relevant Interaction Processes of Tribological Systems with ToF-SIMS

The imaging acquisition and characterization of structures and compositions of tribological system surfaces enables the analysis of tribological system states: (i) in relation to the analyzed dimensions (localization and time), (ii) within different system regions, (iii) in correlation with the characterization of the related tribological interaction processes, and (iv) in correlation with the ascertainment of the temporal development (evolution) of these processes. For such system states within real systems, relevant distinctions and dependencies can be determined in dependence on the considered system regions and the operation times. For systems of grease-lubricated high-speed rolling element bearings, results of systematic investigations on different elements of the tribological systems in the contact regions are presented. The utilization of spatially resolved investigation methods and procedures enables this kind of characterizations of the investigated tribological systems. Tribologically relevant interaction processes like wear, boundary layer formation, oxidation, adsorption and molecular lubricant degradation are considered. Emphases of the presented results are located in the fields of lubricant characterization and characterization of related tribological acting processes for the considered systems.

V18
S05

Germany Trade and Invest (GTAI)
Germany

Dr. Rainer Mueller
Technology Transfer - Manager

The Commercialization of Future Technologies in Germany: Nanotechnology at the Forefront

Germany is not only the European industry giant but without doubt the hotspot for Europe's nanotech scene. Almost 2000 players make up this German scene and Germany's healthy industrial base provides a huge market for nanotech products and nanotech related services. The presentation introduces the most relevant players in public R&D and gives an overview of the demand by specific industries for nanotech based solutions. Additionally the presentation will focus on "Nano in Germany", an alliance led by German industry and R&D players which currently consists of 116 members representing the country's SME and applied science landscape in nanotechnology.

V19
S05

Indian Institute of Technology, Kanpur
Department of Materials Science and Engineering
India

Dr. Kallol Mondal
Associate Professor

Wear Behavior of Bainitic and Conventional Rail and Wheel Steels

Wear of railroad rails and wheels is a complex phenomenon. Increased axle load and train speeds further enhance degradation of rails by wear. Gauge face wear of rails and flange, and tread wear of the railroad wheels are also of major economic concerns. Hence, high strength and wear resistant steels are required. Presently, pearlitic steels are being used as rail materials, and ferritic-pearlitic steels are being used as wheel materials in the Indian Railways. There have been continuous efforts to increase the wear resistance of these conventional rail and wheel steels by different possible routes. Historically, this has been achieved by increasing the hardness. Increasing carbon content and implementing suitable heat treatments to attain finer pearlite have been the most widely adopted ways to increase the hardness of the rail steel, thereby resulting into higher wear resistance. Strategies for reduction of wear in wheels are different, since designing and lubrication aspects are also involved.

V20
S06

Tshwane University of Technology
Institute of NanoEngineering Research
South Africa

Dr. Peter Olubambi
Director

Ru-CNTs reinforced copper as high-performance thermal management material

With the rapid development in electronic technologies, materials properties requirements for thermal management at high operating temperature without compromising performance are becoming higher. Global efforts are therefore being constantly focussed on developing new thermal management materials and techniques to meet the heat dissipation requirements in the new generation power electronic devices. We have explored using a simple and novel powder processing method and spark plasma sintering technique for fabricating copper - ruthenium – carbon nanotubes composite with enhanced thermal management properties.

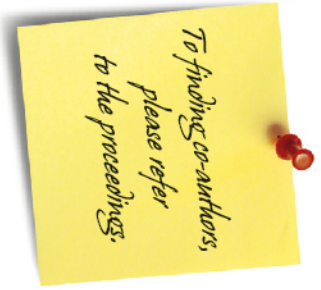
V21
S06

Zoz Group
Germany

Prof. Dr. Henning Zoz
President & CEO

Innovation in Materials and Processes - how to change a good idea into a good product

Great ideas and potential innovations are suffering with respect to market introduction on large barriers: innovation hesitation of the society, risk and fear and other.
Insofar the quantitative promise/expectation of benefit determines the driving force from the innovation itself. The higher the expected benefit of a "better solution" against given solutions, the better the chances for a market introduction In case of "new solutions", usually there is no market which can slow down or end the innovation for years or even decades.
The environment likewise the given market determines the barriers at its levels. The more modern and developed the society is, the higher are such barriers which is represented by regulations and standards but also by availablity "close to satisfaction". E. g. cleantech for transportation suffers on the very cost effective / high quality (even including very clean) availability of fossil based transportation/automotive technology and infrastructure. About 135 years ago, the first commercial combustion engine did operate a few hours in lifespan, today a fuelcell is required to operate thousands of hours under extreme safety requirements/regulations particularly with respect to hydrogen.
Realistically, if somebody today would like to register gasoline or aspirin for the first time for commercial application - for sure he would run into huge barriers as well - however, society is used to those materials and processes.
Back to fossile transportation, even the political driven and not very scientific nor realistic horror scenario around CO2/Carbon Footprint/IPCC could and cannot help. And there is nothing wrong with carbon but fossiles since a hundred years are too good and too short just for burning them away. There is something wrong with the mentioned political activities since we do not need an expensive green religion as/if we have already green technology.



All posters will be on display during the entire Symposium right in the exhibition area

8th German-Japanese | 8th International

Symposium on nanostructures

Poster Sessions

P01 **Università degli Studi di Torino (UNITO)**
Italy

M.Sc. Anna Wolczyk
Early Stage Researcher

Pros and cons of a particular type of synthesis in hydrogen world

Metal hydrides, the scientific focus of ECOSTORE, are of special interest for both: obviously for hydrogen storage, but – as recently found - also for electrochemical energy storage as novel solid state ion conductors and anode conversion materials. They exhibit superior hydrogen and electrochemical energy storage capacities as well as high ionic conductivities at ambient temperatures. Research are focus on hydrogen storage and batteries, working on synthesis (using ball milling, thermal treatment and wet chemistry) and preparing experiments (measuring conductivity, XRD, IR, Raman, PCI, ssNMR, DSC). Results will be compare with modeling calculations from Ab inito and Calphad in a way to better understand dynamic processes. Theoretical and experimental investigations of dynamic involved in hydrogen release and uptake and ion conductivity of advanced nano-materials very much depends on the way of preparing the materials, energy, time and money put into it.

P02 **Universiy of Stuttgart**
Germany

M.Sc. Efi Hadjixenophonotosk
Early Stage Researcher

Ion Beam Sputter Deposition of MgH_2 Thin Films to be used in Battery Applications

Conversion reactions have emerged as an interesting alternative to the current intercalation mechanism of present day commercial Li-ion batteries. Magnesium hydride (MgH_2) specifically, is a noteworthy material because of its dual use as both a hydrogen storage material and as a battery electrode. The MgH_2 reversible conversion reaction ($MgH_2 + 2Li \leftrightarrow Mg + 2LiH$) promises a good theoretical capacity (1480mAh/g) and takes place at ≈0.5V Li^+/Li^*, which makes it a great candidate for a negative electrode in Li-ion batteries. The following work is focused on characterizing MgH_2 thin films (≈200nm) deposited with ion beam sputtering. Here we compare two different samples: MgH_2 deposited directly from a powder target, and Mg metal sputtered and hydrogenated under 100bar pure hydrogen atmosphere. Electrochemical characterization within a liquid electrolyte half cell has been performed in conjunction with SEM, TEM and XRD before and after cycling.

P03 **National Research Center Demokritos, Athens**
Greece

M.Sc. Filippo Peru
PhD Student

Irreversible nanoconfinement of a 1:1 $Mg(NH_2)_2$ and $LiNH_2$ mixture inmesoporous carbon scaffolds

The nanoconfinement of the 1:1 eutectic mixture of $Mg(NH_2)_2$ and $LiNH_2$ was studied in order to investigate the possibility to use it as precursor of $Mg(NH_2)_2$ and LiH irreversible nanosized systems. For this reason we melted and infiltrated the mixture in two mesoporous carbon materials with different pore size (≈5 and ≈20 nm). The efficiency of the overpressure infiltration is shown by the almost total loss of pore volume of the carbons and by the substantial differences between the decomposition process of the as synthesized mixture and the infiltrated systems. Moreover, the TPD-MS analysis shows that the decomposition happens at lower temperatures for the nanoconfined systems, highlighting the catalytic effect of the particle size reduction.

P04 **Aarhus University**
Denmark

M.Sc. Priscilla Huen
PhD Student

MgH_2 as anode in Li-ion batteries

Recently, applications of hydride materials in rechargeable batteries have been reported. Hydride materials can react with Li-ion according to the following reversible conversion reaction:

$$MHx + xLi^+ + xe^- \leftrightarrow M + xLiH \qquad (M = metal, alloy)$$

The theoretical capacities of hydride materials are 2-5 times higher than that of graphite, which today is the commonly used anode material in commercial Li-ion batteries. MgH_2 is one of the hydride materials of interest. Effects of ball milling and different testing conditions on the electrochemical property of MgH_2 were examined. The mechanism of the conversion reaction was also investigated by in-situ powder X-ray diffraction, in order to have a more comprehensive understanding of the reaction mechanisms.

P05 **Institute for Energy Technology (IFE), Kjeller**
Norway

M.Sc. Michael Heere
PhD Student

Hydrogen cycling behavior of Reactive Hydride Composites of NaF-NaH-MgB_2 investigated by in-situ powder diffraction

Light metal borohydrides are of main interest for hydrogen storage due to high hydrogen capacity but applications are hampered by slow kinetics and unfavorable thermodynamics. Reactive Hydride Composites (RHC) with borohydrides, i.e. mixtures of borohydrides with other hydrides and inorganic compounds, are much more tunable and often show better cyclability than pure borohydrides.
The hydrogenation and dehydrogenation properties of RHCs NaF+9NaH+5MgB_2 (1:9 system) and NaF+2NaH+1.5MgB_2 (1:2 system) with theoretical hydrogen absorption values of 7.5 wt.% and 7.0 wt.%, respectively, are studied. A high reversible capacity of 6 wt.% H is measured in the first cycle, but it decreases to almost 3 wt.% H after 5 cycles for NaF+9NaH+5MgB_2. In-situ Synchrotron Radiation Powder X-ray Diffraction has been used to follow the hydrogen absorption, desorption and reabsorption reactions. The first absorption proceeded rather slowly and took hours to complete at 325°C under 50 bar H2. However, after desorption at 510°C, rehydrogenation proceeded in the matter of minutes at the same temperature. $NaBH_4$ is the main phase in the hydrogenated state for both systems. However, after 5 cycles, MgH_2 is only observed in the 1:9 system. Details about the reaction path in the first cycle will be given.
The work was performed within the FP7 Marie Curie ITN ECOSTORE.

P06 **HZG - Helmholtz-Zentrum Geesthacht**
Germany

M.Sc. Antonio Santoru
PhD Student

Desorption properties and reaction mechanism of K-Mg-N-H systems

The $Mg(NH_2)_2$-2LiH reactive hydride composite (RHC) is regarded as one of the most promising amide-based systems for hydrogen storage due to the suitable reaction enthalpy. The main limitation to its implementation on mobile applications is the high kinetic barrier of the dehydrogenation reaction. In this perspective K-based additives recently proved to be effective in lowering the desorption temperature promoting kinetically more favorable reaction paths. In this study we investigate the reactivity of K-Mg-N-H systems focusing on the structural and mechanistic aspects of the desorption process. Several K-Mg-N-H systems were prepared by reactive ball milling under NH_3. In-situ diffraction experiments allowed us to determine the phase evolution and reaction pathway during dehydrogenation. The evaluation of the in-situ diffraction data revealed that part the reaction mechanism underlying the desorption process consist in an exchange of amide-hydride anions mediated by the KNH_2 and KH.

P07

East Paris Institute of Chemistry & Material Science
France

M.Sc. DAO Ha Anh
Researcher, PhD student

Lithium ionic conduction in $LiBH_4$-$LiNH_2$-LiI system

Since the discovery of the first ionic conductor AgI in 1960 with conductivity of 10^{-2} S/cm toward Ag+, material scientists have achieved much development of new ionic conductor generations with higher conductivity and better applicable properties like LiSICON, NaSICON which are promissing for using in LIBs or NIBs. For solid electrolyte in LIBs, LiSICON has been developed with several types: LiPON, thio-LiPON such as $Li_5BaLa_2Ta_2O_{12}$ and LiI–Li_2S–P_2S_5. They have advanced conductivity up to 10^{-3} S/cm for the latter one, however they still have many drawbacks which need to be replaced by other types. The oxide ceramic system frequently involves the problem of seriously high grain boundary resistance, the reactivity of the sulfide-based electrolytes with cathode materials leads to difficulty in battery design. Metal hydride and their complexes of $LiBH_4$ – LiI, $LiBH_4$ - $LiNH_2$ and $LiNH_2$ – LiI systems are proved to have favorable conductivity which can be successfully applied as electrolyte in LIBs. In this poster, study of $LiBH_4$ – $LiNH_2$–LiI system is discussed.

P08

Aarhus University
Denmark

M.Sc. SeyedHosein Payandeh GharibDoust
PhD student

Borohydrides as hydrogen storage carriers

Hydrogen is an energy carrier that can be used to efficiently store regenerative energy. While hydrogen production and conversion are already technologically feasible, its delivery and storage face serious challenges. One of the best method provided was to use materials that could form chemical band with hydrogen and absorb hydrogen in the chemisorption process. Borohydride compounds have attracted considerable attention as hydrogen storage materials because of their high hydrogen content. However, they show several negative characteristics which restrict their applications such as slow kinetics, low yields of hydrogen and problems with regeneration of the parent borohydrides. The synthesis and characterization of a new series of borohydride-based materials will be given.

P09

HZG - Helmholtz-Zentrum Geesthacht
Germany

M.Sc. Le Thi Thu
PhD Student

Initial Effects of Cost Effective Materials in $2LiBH_4$-MgH_2 Hydrogen Storage Material

The composite system $2LiBH_4$-MgH_2 has been demonstrating as a promising material for hydrogen material storage with a capacity up to 11.4 wt% H_2. By catalyzing $TiCl_3$ into $2LiBH_4$-MgH_2 system, high hydrogen capacity can be retained in a system with reduced thermodynamic stability and MgB_2 formation is thermodynamically favored at evaluated temperature. However, this additive $TiCl_3$ is costly in production scale and it should be considerably concerned. In the present work, we found that the titanium aluminum chloride ($3TiCl_3.AlCl_3$) shows as an efficient and cheap additive on sorption kinetics and cycling capability of $2LiBH_4$-MgH_2 material. Further techniques (In situ PXD, volumetric analysis, ASAXS, XRD) are employed to investigate fully thermodynamic and kinetics properties of catalyzed materials.

P10 **University of Birmingham**
United Kingdom

M.Sc. Yinzhe Liu
PhD Student

Raman studies on eutectic melting systems in metal borohydrides

A safe and efficient way of hydrogen storage is a crucial challenge in realizing low-carbon transport in a green energy society. The borohydrides of light metals are pursued as potential hydrogen storage media due to their relatively high gravimetric and volumetric hydrogen storage capacities. However, their high dehydrogenation temperature and limited reversibility have so far prevented their use in real applications. Remarkably, eutectic melting occurs in mixtures of alkali and alkali earth metal borohydrides, which may destabilize the system and expedite hydrogen release at a temperature lower than that of the individual compounds. This poster describes studies of dehydrogenation processes in monometallic metal borohydrides and borohydride eutectic mixtures using ex- and *in- situ* Raman spectroscopy.

P11 **East Paris Institute of Chemistry & Material Science**
France

Nicola Berti
PhD Student

Negative electrodes based on metal hydrides for Li-ion batteries

Li-ion batteries are the most used rechargeable batteries available. Although the performance of these batteries has been improved considerably in the last decades, there is a common agreement that this technology is now close to its maximum efficiency unless new materials with higher storage capacity are found. Recently it has been demonstrated that many metal hydrides can react with lithium according to the general equation:

$$MH_x + xLi^+ + xe^- \leftrightarrow M + xLiH$$

This conversion reaction can provide higher capacity than common graphite anodes (2000 mAh/g for MgH_2 vs. 370 mAh/g for graphite) with low polarization. However, the commercial use of these compounds as electrodes for Li-ion batteries has been hindered to date by their short cycle life and sluggish kinetics at room temperature.The aim is to understand the reaction mechanisms between metal hydrides and lithium and the processes that limit the reversibility during extended charge-discharge cycles.

P12 **Ritsumeikan University**
Japan

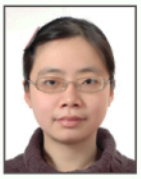
M.Sc. Bhupendra Sharma
PhD Student

Feasibility study to Fabricate Ultra-Fine Grained Beta-Titanium alloy by following a Novel Powder Metallurgy

In recent years, Ti-Nb based alloys have attracted significant interest as a promising material for biomedical applications, such as body implants. However, preparing ultra-fine grained (UFG) Ti-Nb-alloys, with high strength and retained low young modulus, via conventional ingot metallurgy processing approach has been an important and critical issue due to the difficulties associated with the thermo-mechanical treatment of these alloys at elevated temperature. Powder metallurgy is considered an efficient and attractive method to prepare fine-grained alloys with controlled/tailored microstructure. In the present work, a new powder metallurgy route has been developed to fabricate fine-grained beta Ti-Nb-based alloys from elemental powders. The proposed route involved mechanical milling (MM) of TiH_2 and elemental Nb powder mixture followed by their consolidation. Subsequently, the MM powder was consolidated by Spark Plasma Sintering (SPS). In the present work, microstructural evolution at every stage of processing of Ti-40 mass% Nb is presented and discussed.

P13 **Ritsumeikan University**
Japan

M.Sc. Han YU



Compare Analysis of Harmonic and Heterogeneous Bimodal Structured Compacts based on Multi-Scale FEM

The harmonic structure materials consist of coarse-grained areas enclosed in a three-dimensional continuously connected network of ultrafine-grained area. The concept of harmonic structure design has been successfully applied to a variety of pure metals and alloys by mechanical milling (MM) and subsequent powder metallurgy (PM) process. The experiments results exhibited that the harmonic structure materials can achieve both strength and ductility simultaneously. In this research, in order to make certain the reason why the harmonic structure material can keep the high strength and high elongation simultaneously, the comparative analysis of harmonic and heterogeneous bimodal structured compacts--which is made from jet milling processing-based on the Multi-Scale Finite Element Analysis (FEA) has been employed.
The results show that there is still some Mises stress and strain localization happening in the ordinary heterogeneous bimodal microstructure, while the network structure of the harmonic structure materials avoids the Mises stress and strain localization. Compare to the ordinary heterogeneous bimodal microstructure, the harmonic structure materials exhibit more excellent mechanical performance.

P14 **Ritsumeikan University**
Japan

M.Sc. Nur Zalikha Binti Khalil
PhD Student

Effect of Particle Size Distribution and Particle Morphology on Sinterability of SiC Ceramic

Silicon Carbide (SiC) has drawn a wide attention in recent decades for its excellent mechanical properties such as high oxidation resistance, high hardness and low density. However, the brittleness of SiC has limited its wide range application. Therefore, this work aims to investigate the possibility to improve mechanical properties of SiC by controlling particle size distribution. In present work, a mixture of SiC powders, consisting of powders of sizes 0.3μm and 3.0μm, was subjected to mechanical milling in order to produce various patterns of particle size distributions. Subsequently, milled powders were subjected to spark plasma sintering. This sintering technology is used in account of its rapid heating and short time sintering. An attempt was made to establish the relationship between the particle size distribution and mechanical properties of the sintered compacts. The result showed that mechanical properties of SiC compact can be improved by controlling the particle size distribution in the starting SiC powders.

P15 **Ritsumeikan University**
Japan

Prof. Kenji Harafuji
Professor of Physics

The effect of UV Ozone Treatment on the Stability of Organic Solar Cells

The degradation phenomenon in small molecule organic solar cells (OSCs) has been experimentally investigated under two kinds of stress, that is, air exposure and repetitive illumination. The OSC has the structure of an indium tin oxide (ITO, anode)/copper phthalocyanine (CuPc, donor)/fullerene (acceptor)/bathocuproine (buffer)/Ag (cathode). Two possible measures are studied to increase the initial device performance and achieve stability against the stresses. The first is the introduction of anode buffer of thin pentacene layer (3 nm) inserted between the anode and CuPc. The second is the ultraviolet (UV) ozone treatment on the ITO surface. The anode buffer plays a role of enhancement of short-circuit current, open-circuit voltage, and efficiency. The UV ozone treatment does not bring about no appreciable effectiveness against the degradation under air exposure. On the other hand, the UV ozone treatment achieves much decrease of the degradation under the repetitive illumination stress.

P16 **Ritsumeikan University**
Japan

Mr. Yosuke Onishi
Undergraduate student

Thin-film transistors utilizing a C_8-BTBT layer re-crystallized under a temperature gradient induced

It is desired to control the direction of single crystals for increasing the drain current in a transistor and reducing its variation among devices. A non-contact process for this directional growth would offer advantages in throughput and cleanliness. Previously, we proposed to utilize a temperature gradient for recrystallizing an organic semiconductor film: a temperature gradient was established in a spin-coated film of 2,7-dioctyl [1] benzothieno [3,2-b] benzothiophene (C8-BTBT) by air convection. A technique utilizing light for generating a temperature gradient is of interest for achieving higher through-put. For this purpose, we used a halogen lamp to irradiate a line-shaped region on the film continuously. A C8-BTBT film on a glass substrate was successfully solidified by this technique and optical anisotropy of the film was confirmed by polarization microscope observation. In addition, cracks in the film showed that the melt-solid interface moved laterally. We replaced the glass substrate by a heavily-doped silicon substrate with a 200nm-thick thermal oxide layer and fabricated top-contact, bottom-gate transistors with these C8-BTBT films. Microscope observation on the channel regions of such transistors revealed crack formation. Its patterns indicated that a temperature gradient was created perpendicular to the 2.5mm-wide region exposed to the light. Transfer characteristics of two TFTs (Device ? and Device ?) show that the mobility of Device ? is higher than that of Device ?. In future, elimination of the cracks would improve charge transport and reduce performance variation among devices. It should be noted that the intense light from the halogen lamp did not damage the C8-BTBT films.

P17 **Ritsumeikan University**
Japan

Taku Miura
Graduate School of Science and Engineering

Evaluation of Fatigue Crack Growth for Chromium Molybdenum Steel (JIS SCM435) by Means of Real-time Observations

In order to evaluate the fatigue strength of the machine structures, it is necessary to know the fatigue crack growth properties. Conventionally, replica method has been used to investigate the fatigue crack growth properties. However, this method may give incorrect test results due to repeated suspension and resumption of the fatigue test. Thus, real-time fatigue crack observation system, using a digital video camera, has been settled on a rotating bending fatigue testing machine in this study. This system does not require any suspension of the fatigue test and enables us to obtain easily long-term data. The purpose of this study is to investigate the fatigue crack growth properties of JIS SCM435 including the very high cycle regime by using the introduced system.

P18 **Indian Institute of Technology Hyderabad (IIT)**
India

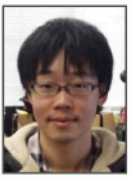
M.Sc. Rajamallu Karre
PhD Student

Design and Fabrication of Biocompatible β Titanium alloys for Orthopedic Implants

Titanium and its alloys have attracted considerable attention and interest in recent years due to their potential biomedical applications. These alloys possess high specific strength, superior biocompatibility, excellent wear and corrosion resistance in biological environment and provide adequate mechanical properties when compared to other metallic biomaterials. First principle calculations based on density functional framework are employed to study the stability of β phase (bcc) with respect to α phase (hcp) in Ti-x (at.%) Nb alloys (x=6.25, 12.50, 18.75, 25, 31.25, 37.50, 50). In addition the elastic properties of all these combinations are calculated. The calculations showed that β phase in binary Ti-x(at.%)Nb is fully stabilized above 22 (at.%) of Nb content. Calculated Young's modulus for Ti-25 (at.%)Nb is found to be 80GPa which is lower than the α-Ti alloys and therefore suggesting reduction of 'stress shielding effect'. Thermodynamically stable β phase in binary Ti-x (at.%) Nb is experimentally achieved with P/M prepared 25 (at.%) of Nb and is confirmed by X-ray diffraction analysis.

P19 **Ritsumeikan University**
Japan

Teppei Morita
Graduate Student



The coordination ability of substituted ferrocenes bearing alkyl group

A lot of ferrocene derivatives are able to be synthesized from ferrocene by electrophilic substitution due to its aromaticity. Ferrocene-containing ligands are expected to catch ions and form complexes. Electrochemical and spectroscopic behaviors of ferrocenes are influenced by the coordination of ions. In this study, we synthesized ferrocene-containg ligands and discussed their coordination ability to metal ions.
We synthesized two types of ferrocene-based ligands. One is the derivative having acetylphenyl groups, and another is those having ethyleneoxy chains. Their coordination ability to metal ions studied by means of 1H-NMR, HPLC and UV-vis spectra. Perchlorates of various metals were used as metal ion sources.

P20 **Ritsumeikan University**
Japan

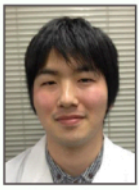
Hiroaki Fukao
Graduate Student

Pressure effects of the partial molar volume of sodium chloride in water using molecular dynamics simulation

Partial molar volume of sodium chloride in water at 298 K and pressures up to 1000 MPa was caluculated using molecular dynamics simulation using water potentials of TIP4P, TIP3P, and SPC/E, respectively. All of the partial molar volumes using these three potentials increased as pressure increased by 77-178 %. Similar increasing of the partial molar volume of sodium chloride, 49 % at 1000 MPa was observed by high-pressure aqueous density measurement by Adams and Hall [1].
[1] L.H. Adams, and R. H. Hall, J. Wash. Acad. Soc. 21, 183 (1931).

P21 **Ritsumeikan University**
Japan

Yu Makabe
Graduate Student



Microwave irradiation effects for esterification reactions and etherification reactions of ferrocene

Microwave irradiation has been used for syntheses of various organic compounds. The irradiation brings about shorting of reaction time and improvement of the selectivity. However, the mechanism is not clear in detail. Ferrocene is organometallic compound including Fe2+ between two five-membered carbon rings (cyclopentadienyl anion). The Fe2+ moiety is expected to efficiently absorb microwave; Ferrocene molecules would have antenna effect. In this research esterification and etherification were used as model to prove the antenna effect.
To verify the antenna effect of ferrocene's Fe2+, we attempted to proceed these reactions for both ferrocene derivatives and benzene derivatives under microwave irradiation and conventional heating. The resulting yields were compared between of ferrocene derivatives and benzene derivatives to discuss the antenna effect of ferrocene molecule.

P22 **Ritsumeikan University**
Japan

Yoshinobu Yoshihara
Graduate Student

Development and Application of Capacitive Deionization System

Capacitive deionization (CDI) technique having higher efficiency and lower operation cost in comparison with the reverse osmosis technique was investigated. We have developed a simple and inexpensive hydrophilic activated-charcoal based electrode for capacitive deionizer cell system and examined its physical and electrochemical properties. An asymmetrical distribution of capacities of both electrodes was found to be ideal wherein no electrochemical reactions took place at the electrode surface. The ion adsorption/desorption mechanisms of CDI stack equipped with the developed activated-charcoal electrodes, having either uni-polar or bi-polar circuit structures, were evaluated. The experimental results showed that the CDI stack with a bi-polar circuit consumes 70% less energy than that with a uni-polar connection. As for operation of the processing fluid, a combined flow-through and batch processing operation for ion adsorption and desorption processes shows the best working efficiency for throughput. Furthermore, the energy recovery by discharging the stored energy of the ion desorbing electrode pair to another pair for ion adsorption by switching four-CDI cells for both the discharge and the charge sides was 81% at the maximum.

P23 **Ritsumeikan University**
Japan

Masahiro Karita
Graduate Student

Luminescence Properties of Mn^{2}+ Doped Zn_2GeO_4 and Li_2ZnGeO_4 Thin Films Prepared by Sol-Gel Method

Mn2+ is well known as a green-light emitting center due to the 4T1 → 6A1 transition in host materials such as Zn2GeO4 and Li2ZnGeO4. In particular, it has recently been reported that Li2ZnGeO4:Mn2+ green phosphor shows excellent cathode luminescence (CL) under the electron beam excitation, and it may be applicable to a field emission display (FED) panel. In the present study, we prepared Zn2GeO4:Mn2+ and Li2ZnGeO4:Mn2+ thin films by a sol-gel method with dip- and spin-coating methods, and investigated their luminescence properties. The highest luminescence quantum yield value of 78 % was observed from a Zn2GeO4:Mn2+ thin film prepared by a spin-coating method with subsequent heat treatment at 1100 oC for 3 h. The Li2ZnGeO4:Mn2+ thin films tend to be crystallized at lower temperatures than the Zn2GeO4:Mn2+ thin films. We will investigate luminescence of the Li2ZnGeO4:Mn2+ thin films and electro-luminescence (EL) of the Zn2GeO4:Mn2+ and Li2ZnGeO4:Mn2+ thin films.

P24 **Ritsumeikan University**
Japan

Sota Oshima
Graduate Student

Development of Crack Detection System Based on DIC Method Using Flexible Nodes Arrangement

Flexible nodes arrangement is applied to the crack monitoring system based on DIC (Digital Image Correlation) method to improve the accuracy of crack detection. In this system, digital image of the inspection area is discretized by using three-node triangular elements. Crack width can be estimated by the displacement field of nodes calculated by the DIC technique for each element. However, the accuracy in calculation of the displacement field may decrease, when the cracks are involved in the comparing window. To avoid this problem, flexible nodes arrangement and variable comparing window are devised. A four-point bending specimen was used for the validation. By installing the proposed system, the correlation coefficient increased by 5.0% compared to the result using the conventional method and the mismatched nodes were not found in the inspection area.

P25 **Ritsumeikan University**
Japan

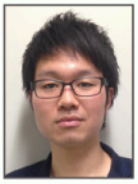
Muhammad Aqmal B.A.H.
Graduate Student

Loading Rate Effects on Fatigue Crack Growth Behaviour of CFRP Adhesive Joints under Mixed Mode Conditions

The present study discusses the relationship of loading rate and mixed mode I /ΓΙ (tensile/in-plane shear) fatigue crack growth behaviours of adhesively-bonded fibre composite joints. Unidirectional CFRP (T700SC/2592) were bonded using epoxy-adhesive (EP008). MMF (Mixed Mode Flexure) tests were carried out at loading frequencies of 0.1Hz, 1Hz and 10Hz to investigate the effects of loading rate and at mixed mode ratios of 1, 2 and 4 to investigate the effects of loading mode. The experimental result of MMF tests confirmed that load-displacement relation was almost linear in fatigue tests. Thus, the compliance method was applied to evaluate energy release rate and crack growth rate of specimens. Threshold values of energy release rates for crack growth rate were independent to loading rate regardless of loading mode. However, crack growth rates were dependent to loading rate as energy release rates increase over certain values.

P26 **Ritsumeikan University**
Japan

Shota Kikuzaki
Graduate Student



Effects of Sulfur Electrolyte Additives on Li-ion Batteries and X-ray Absorption Spectroscopic Studies of Solid

In the present study, the effects of sulfur electrolyte additives such as 1,3-propane sultone (PS) and ethylene sulfite (ES) on lithium ion batteries were investigated. A solid electrolyte interface (SEI) formed on the electrodes by these additives was analyzed by soft X-ray absorption spectroscopy (XAS). PS or ES was added at various volume concentrations in an electrolyte solution. LiCoO2/graphite cells using PS or ES were assembled in an argon-filled glove box and cycled. As a result, the cycling performance of the cells was improved by adding 5.0 vol% PS or 1.0 vol% ES. XAS analyses of the SEI formed on the electrodes revealed that the SEI contained sulfur compounds with divalent, tetravalent and hexavalent sulfur atoms. It is believed that these sulfur compounds in the SEI were formed from the sulfur additives, and improved the cycling performance of the cells.

P27 **Ritsumeikan University**
Japan

Hitoya Nakasato
Graduate Student

Photoluminescence and Electrical Conductivity of Discotic Trinuclear Gold (I) Complexes

Gold(I) complexes show strong luminescence in solid states. Since the strong luminescence results from aurophilic interaction between Au atoms in the solid state, we consider that gold complexes should show various luminescence behavior by controlling their aggregated structure in the solid. In order to control the aggregated structure, we introduced liquid crystallinity to gold complexes. Liquid crystal (LC) has regularity and mobility, so it is easy to control aggregated structures by external stimuli. In this study, we synthesized discotic trinuclear gold complexes (Figure 1). Those complexes emitted various colors (yellow, purple, red), depending on length of the alkyl side chains. The complexes showed thermochromic photoluminescence: the luminescence color was tunable by control of the thermal phase transition. Moreover, we measured electrical conductivity of the complexes to evaluate a possibility of application to organic LED materials.

P28 **Ritsumeikan University**
Japan

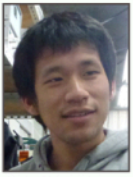
Yuki Rokusha
Graduate Student

Photoluminescent Properties of Liquid-Crystalline Gold Complexes with a Bicyclic Core.

Gold (I) complexes have attracted considerable attention as promising light-emitting materials, since they show strong luminescence even in condensed phases. The luminescence derives from an aurophilic interaction, which is a non-covalent interaction between Au atoms, therefore, the luminescent behavior was affected by their aggregated arrangement. We have developed a rod-like gold complex P6 (Figure 1) with a liquid-crystallinity (LC), and attained reversible luminescent control due to tuning its aggregated structure through the phase transition. Next our interest was directed toward LC molecules containing a polycyclic aromatic ring in a mesogenic core, because an introduction of such structure could achieve a broaden temperature range of the LC phases and intriguing luminescent properties. In this work, we synthesized a rod-like gold complex B6 (Figure 1) with a biphenyl structure, and demonstrated that B6 showed a wider temperature range of the LC phases. Furthermore, we examined its photoluminescent behavior in various condensed phases.

P29 **Ritsumeikan University**
Japan

Daiki Takahata
Graduate Student



Synthesis and Characterization of Polyoxotungstate-Based Organic/Inorganic Hybrids Through Covalent Bonds

Recently, polyoxometalate (POxM) have received an enormous attention because of their electrical, magnetic and/or photochemical characteristics. We have reported syntheses and characterization of organic-inorganic hybrids of polyoxomolybdate with quaternary ammonium organic molecules through electrostatic interaction. We found that the hybrids exhibited liquid-crystalline behavior. In this study, we introduced organic molecules to polyoxomolybdate via covalent bond to precisely control aggregated structures as well as the molecular structure of hybrids. A lacunary structure was introduced into Keggin-type phosphotungstic acid(L-POxM) to activate reactivity to organic molecules, and then L-POxM was treated with organosilane derivatives to form covalent bond (Figure 1). We found that the resulting hybrids have electrochromic properties.

P30 **Ritsumeikan University**
Japan

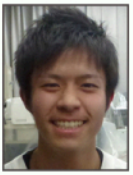
Ryohei Watanabe
Graduate Student

Photoluminescence and Electrical Conductivity of Discotic Trinuclear Gold (I) Complexes

Polyoxometalates have gotten much attention because of its unique chemical structures and specific characteristics. Among such compounds, we focused on the giant-ring polyoxomolybdate (POxMo), which has a 2-nm vacancy at the center of the molecule and shows specific electro chemical properties. We considered that the aggregated structures of POxMo should be controlled to bring out the highest performance of this material. Therefore, we synthesized organic/inorganic hybrids containing dendrimer-like organic molecules and POxMo to control aggregated structures by liquid-crystallinity of organic molecules. The structures of POxMo and organic molecules are shown in Figure 1. POxMo and these organic molecules were hybridized by ion-exchange method. The resulting hybrids showed liquid-crystalline phase and we speculated that liquid-crystalline behavior of hybrids depended on not only the bulkiness of organic molecules, but also its introduction amounts into POxMo.

P31 **Ritsumeikan University**
Japan

Shumpei Hayashi
Graduate Student



Non-linear Photoresponsive Behavior of Azobenzene-Mixed Liquid Crystals

Azobenzene derivatives have been recognized as one of the most important photochromic molecules, which can change their molecular properties by isomerization between trans- and cis-configuration. We have reported that liquid crystal (LC)-to-isotropic (I) phase transition of azobenzene-containing LC materials can be reversibly induced by the cis-trans isomerization, which led to change in birefringence and refractive index of the materials. Herein, we disclose a non-liner photoresponsive behavior of azobenzene–LC systems prepared from Azo and 5CB (Figure 1). When a binary LC mixture containing 2 mol% of azobenzene derivative was irradiated at 488 nm with an Ar+ laser (15 mW/cm2) at 37.5 °C, it was observed with polarized microscope that a unique sequential mutation of LC texture caused by self-oscillation of the LC phase. It can be considered that the phenomenon observed is attributed to an emergence of dissipative structure in the azobenzene-LC systems.

P32 **Ritsumeikan University**
Japan

Ryo Kawano
Graduate Student

Phase Transition and Photoluminescence Behavior of Liquid-Crystalline Gold Complexes Containing cis-Form Flexible Chain

Gold (I) complexes exhibit strong luminescence in condensed phases due to an aurophilic interaction, which depends on the aggregated structure. Thereby, the luminescent property of gold complexes can be tuned by controlling the aggregated structure. We have developed rod-like gold complexes with liquid-crystalline (LC) property and revealed that they displayed unique photoluminescence. In this study, we investigated ?phase transition and photoluminescent behavior of novel rod-like gold complexes containing cis-?form internal alkene in the flexible chain (Figure 1). Complex 1 having benzene ring did not show LC phases, however, complex 2 and 3 with multi-ring system showed nematic (N) LC phase. These gold complexes exhibit unique photoluminescent behavior in condensed phases depends on their aggregated structure. In this presentation, we will discuss with the relationship between the luminescent properties and aggregated structure.

P33 **Ritsumeikan University**
Japan

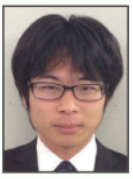
Ryohei Watanabe
Graduate Student

Photoluminescence and Electrical Conductivity of Discotic Trinuclear Gold (I) Complexes

Polyoxometalates have gotten much attention because of its unique chemical structures and specific characteristics. Among such compounds, we focused on the giant-ring polyoxomolybdate (POxMo), which has a 2-nm vacancy at the center of the molecule and shows specific electro chemical properties. We considered that the aggregated structures of POxMo should be controlled to bring out the highest performance of this material. Therefore, we synthesized organic/inorganic hybrids containing dendrimer-like organic molecules and POxMo to control aggregated structures by liquid-crystallinity of organic molecules. The structures of POxMo and organic molecules are shown in Figure 1. POxMo and these organic molecules were hybridized by ion-exchange method. The resulting hybrids showed liquid-crystalline phase and we speculated that liquid-crystalline behavior of hybrids depended on not only the bulkiness of organic molecules, but also its introduction amounts into POxMo.

P34 **Ritsumeikan University**
Japan

Hiroki Nagao
Graduate Student



Effect of Additional Alloying Elements on Creep Properties of Sn-1.0Ag-0.7Cu Solders

This study presents creep properties of four kinds of low Ag based solders. The four kinds of low Ag based solders were Sn1.0Ag0.7, Sn1.0Ag0.7Cu2.0Bi, Sn1.0Ag0.7Cu0.07Ni0.01Ge and Sn1.0Ag0.7Cu2.0Bi0.07Ni0.01Ge solders. Cooling rate for casting solders set at approximately 10K/s. Creep tests were performed using a miniature specimen with 25mm gage length and 2mm diameter at 313K and 353K. Effect of additional alloying elements on properties of deformation rupture time for the four types of solders based on experimental results in the creep test.
The Sn1.0Ag0.7Cu2.0Bi0.07Ni0.01Ge showed the longest creep rupture lifetimes. The creep rupture lifetimes of Sn1.0Ag0.7Cu2.0Bi0.07Ni0.01Ge is about 10 times longer than the Sn1.0Ag0.7 of creep rupture lifetimes. The additional alloying elements clearly increase on creep rupture lifetimes of Sn-1.0Ag-0.7Cu solders. The relationship between rupture time and minimum creep strain rate was well expressed by Monkman-Grant equation, independent on the additive elements and temperature.

P35 **Ritsumeikan University**
Japan

Dr. Hideyuki Kanayama

The Effect of Filler on Creep Characteristics of Polyamide Resin Thin Films

This study presents creep characteristics of three types of polyamide resin thin films with different filler contents for electronic devices. The silica grain filler was mixed into the polyamide resin to reduce thermal stress. Tensile creep tests were performed using the polyamide resin thin films with 30mm gage length, 5mm width and 15?m thickness at two testing temperatures, 398K and 423K. Minimum creep strain rate and rupture lifetime were significantly influenced by content of the filler in resin and testing temperature. Increase of the content of the filler leads to reducing in minimum creep strain rate resulting in increase of creep rupture time. New methods based rules of mixture by Voigt, Reuss and Hill of correlating minimum creep strain rates and rupture lifetimes were proposed.

P36 **Ritsumeikan University**
Japan

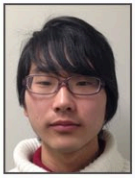
Yuuya Murakami
Graduate Student

Creep-fatigue Life of F82H Steel under Non-proportional Loading

In this study, creep-fatigue tests under non-proportional loading with various strain waveforms were carried out using a hollow cylinder specimen of F82H steel at 823K in air. In the test, two types of strain path were employed. They are a push-pull (proportional loading) and circle (non-proportional loading). Failure life is affected largely by not only strain path (multiaxiality) but also strain waveform (creep) and clearly reduction in failure life in the circle test compared with push-pull test. In the push-pull test, failure life decreases with decreasing the strain rate at the same strain range. In the circle test, stress relaxation due to the creep can lead the reduction in intensity of non-proportionality of loading. By using a new creep parameter, all of the tests under different waveforms done in this study can be well concluded within a factor of 2.

P37 **Ritsumeikan University**
Japan

Shohei Oku
Graduate Student



Preparation of Tb^{3}+-doped Ta_2O_5 fluorescent, spherical particles by sol-gel method with W/O emulsion

In the present study, we prepared Tb^{3}+-doped Ta_2O_5 fluorescent, spherical particles by sol-gel method using a reaction field of a W/O emulsion. Samples of xTb_2O_3-$(100-x)Ta_2O_5$ (x = 0-40) were synthesized using three kinds of surfactant: sodium laurate, Aerosol OT, and IGEPAL CO-520. Spherical particles with x = 9 had the smallest size of about 250 nm. With x values greater than 9, samples became less spherical. When sodium laurate was used, spherical particles were obtained to be less aggregated. A sample with x = 33 showed the greatest fluorescence quantum yield of 14 %. To obtain smaller, better samples, we will use a homogenizer for stirring a sol-gel, W/O emulsion solution.

P38 **Ritsumeikan University**
Japan

Eri Atsuda
Graduate Student

High pressure solubility and partial molar volume of L-tyrosine in water at 298.2 K

Solubility of L-tyrosine was measured at 298.2 K and pressures up to 200 MPa using a clamp-type optical cell made of 17-4 PH stainless steel designed by one of us1). Water and excess L-tyrosine were placed in the cell. To estimate the solubility, we measured the absorption spectra of L-tyrosine in a water phase in the cell. Solubility of L-tyrosine increased with increasing pressure. Partial molar volume of L-tyrosine was estimated from the high-pressure solubility using a thermodynamic equation (Eq. 1):

P39 **Ritsumeikan University**
Japan

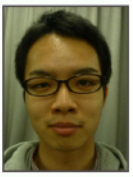
Koki Umeda
Graduate Student

Investigation of Crater Formation Mechanism on Aluminum Foam under High Speed Impact

When a high-speed projectile collides with aluminum foam, it has been reported that unique crater which has narrow entrance and large cavity like a turnip is formed. In case of a material with higher porosity, it is considered that debris cloud is produced by the impact, and the crater is created by scattering it into the inside of the material. In addition, melting traces are observed and it is predicted to melt with heat created by the impact. Measurement methods of the transient impact temperature were investigated due to record temperature changes near the impact point, which contribute to elucidate the crater formation mechanism.

P40 **Ritsumeikan University**
Japan

Takayuki Shimada
Graduate Student



Electro-rheological effect of the liquid crystalline side-on silsesquioxane derivative mixed with a nematic solvent

Electro-rheological (ER) effect is defined as a reversible change of the rheological properties of a fluid by an applied electric field. The fluids with this property are called ER fluids. In our laboratory, the liquid crystalline (LC) silsesquioxane derivatives using octakis(dimethylsiloxy)-T8-silsesquioxane (silsesquioxane) as a cubic core have been synthesized, and their phase transition behavior and the ER effect have been studied. Silsesquioxane derivatives have little entanglement between the neighboring molecules, therefore it is expected that the molecular orientation to an electric field is smoothly induced. Particularly, the side-on LC silsesquioxane derivatives showed a relatively large ER effect1). In addition, the ER response of the side-on LC polysiloxane mixed with the low molecular weight nematic LC (5CB) was found to be improved, compared with that of the undiluted sample2). The influence of the mixing 5CB with the LC silsesquioxane derivative on the ER effect was discussed in this study.

P41 **Ritsumeikan University**
Japan

Kishi Yuki
Graduate Student

The Physical Properties of The Cyclosiloxane Derivatives with Varied Alkyl Chain Length in The Side-on Mesogens

Electro-rheological (ER) effects are defined as a reversible change of the rheological properties of a fluid by an applying electric field. Liquid crystalline (LC) materials are attracted as the materials exhibiting ER effects in recent years. In this study, the LC cyclosiloxane derivatives using 1,3,5,7-tetramethylcyclotetrasiloxane (cyclosiloxane) as a cyclic core were synthesized and their physical properties were measured. In addition, the alkyl chain length in the mesogens of the objective compounds was varied. As a result of the observation by a polarizing optical microscope, the nematic phase was observed with particular alkyl chain length, 6 and 8. The correlation between the alkyl chain length and the physical properties was discussed.

P42 **Global Innovation Research - Organization**
Japan

Dr. Benjamin Guennec
Researcher

Specificities of the Fatigue Properties of S15C Low Carbon Steel at 20 kHz Ultrasonic Loading Condition

This presentation will introduce mainly the results related to the fatigue properties of S15C low carbon steel at ultrasonic frequency of f = 20 kHz, even though some results of fatigue tests conducted at usual frequencies, where 0.2 Hz ≤ f ≤ 140 Hz, will be involved. It includes a various kind of experiments in order to indentify the causes of the remarkable effect of the frequency on S15C steel, as slip band observations, crack initiation behavior study and dislocation structure observations.
Several fundamental fatigue properties of S15C steel appear to be notably different at ultrasonic frequency and at usual frequencies. At ultrasonic frequency of f = 20 kHz, the slip band are very located in a few grains, crack initiation mode becomes exclusively intergranular and dislocation micrographs show very particular structures.
All these changes can be explained in relation with the microstructure of low carbon steel, heavily composed by bcc ferrite. Finally some discussions will be held on the influence of the carbon content on fatigue properties of carbon steel at f = 20 kHz

P43 **Ritsumeikan University**
Japan

Shun Okada
Graduate Student

Microstructure and mechanical properties of pure-Ni with harmonic structure

In the present study, a new heterogeneous microstructure design, consisting of coarse grained area ("Core") enclosed in a three dimensional continuously connected network of fine grained structure ("Shell"), is proposed for the strengthening of Pure-Ni to achieve improved mechanical performance. Such a microstructure is referred as "Harmonic Structure"[1-2]. Generally, this microstructure is produced by powder metallurgy process via controlled mechanical milling followed by consolidation. In the present case, Ni powder had nano sized grains in the surface region and micronsized coarse grains in the center of powder particle. The spark plasma sintering of milled powder led to the full density Ni compacts with harmonic structure. The harmonic Pure-Ni compacts exhibited significantly better combination of strength and toughness, as compared to the homogeneously coarse grained compacts prepared from initial powder. It is suggested that the harmonic structure designed compact has exhibit outstanding mechanical properties by promoting uniform distribution of strain during plastic deformation.

P44 **Ritsumeikan University**
Japan

Kiichi Sawai
Graduate Student

Harmonic Structure Design of Pure Fe and its Unique Deformation Behavior

The harmonic structure is a unique bimodal microstructural design which provides an opportunity to achieve increased energy and resource savings through component miniaturization and performance improvement via improved set of mechanical properties. This microstructure design has already been applied to different types of materials such as pure Fe, pure Cu, stainless (SUS316L), pure Ti and Co-Cr alloy, which have demonstrated superior mechanical properties as compared to their fine- and coarse grained counterparts. However, the deformation behavior of pure Fe was found to be quite different from other materials. Therefore, the present work is focused on the detailed evaluation of the deformation behavior of pure Fe with harmonic structure, and its comparison with the other materials. An attempt has also been made to elaborate the possible mechanism for such an unique deformation behavior in harmonic structured pure Fe.

P45 **Ritsumeikan University**
Japan

Ryo Maeda
Graduate Student

Harmonic Structure Designed Ti-6Al-4V Alloy Compacts by High Pressure Gas Jet Milling Process

A new heterogeneous bimodal microstructure design, consisting of coarse-grained area enclosed in a three-dimensional continuously connected network of fine-grained structure, is proposed for the strengthening of Ti-6Al-4V alloy to achieve improved performance of components. Such a microstructure is referred as "Harmonic Structure". This microstructure is created by a powder metallurgy process consisting of controlled mechanical milling followed by consolidation. A novel high pressure gas milling (HPGM) process has been proposed for controlled mechanical milling. The milled powder exhibited bimodal microstructure, having nanosized grains near the surface region and micron-sized coarse grains in the center of the powder particle. Subsequently, the milled powder was consolidated by Spark Plasma Sintering. The sintered Ti-6Al-4V alloy compacts had harmonic structure, which exhibited a significantly better combination of strength and toughness as compared to their homogeneous fine and coarse grained counterparts. It is indicated that the harmonic structure designed compact exhibit outstanding mechanical properties via avoiding localized plastic instability by promoting the uniform distribution of strain during plastic deformation.

P46

University of Geneva
Schwitzerland

M.Sc. Matteo Brighi
Early Stage Researcher

Doping mechanism on borohydride garnet ionic conductor

The interest for BH4-based ionic compounds is mainly due to their high gravimetric hydrogen capacity which makes the compounds suitable for hydrogen storage. Beside that, batteries and fuel cells are more and more developed in terms of capacity and safety; the latter could be improved replacing liquid electrolyte (nowadays mostly used) with solid state electrolytes (SSE).
A novel garnet-type Li3+xK3Ce2-xAx(BH4)12 suitable as SSE has been discovered and studied with different concentration of mono and divalent cation doping (A=Na, K, Rb, Ca, Sr, Eu); Li+ mobility has been studied with Electrochemical Impedance Spectroscopy and highlight how the dopant (substituting on the Ce3+ site) improves the ionic conductivity from 10-8 S/cm, for the undoped sample, to 10-6 S/cm (A=Eu; x=0.2).
Structural details of this promising novel SSE has been studied by in-situ X-ray powder diffraction, and related to know garnet-type oxide SSE.

8th German-Japanese | 8th International

Symposium on nanostructures

Exhibitors

Alphabetical list of exhibitors

Analytical Tribology Network	D-48053 Muenster	Germany	E01
Autoworld Parts Co., Ltd.	Mira Loma, CA 91752	USA	E02
Daikin Industries Ltd.	566-8585 Settsu	Japan	E03
EUROGIA2020	1200 Brussels	Belgium	E04
Fukuda Metal Foil & Powder Co., LTD.	607-8305 Kyoto	Japan	E05
Germany Trade and Invest GmbH	D-10117 Berlin	Germany	E06
Harke Group	D-45479 Muelheim a. d. Ruhr	Germany	E07
Japan Metals and Chemicals Co., Ltd.	525-8577 Kusatsu	Japan	E08
KAMI, Korea Advanced Machinery Inc.	153-789 Seoul	Korea	E09
Kunming University of Science and Technology	650093 Kunming, Yunman	P.R. China	E10
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NRW Japan K. K.	102-0094 Tokyo	Japan	E12
Nano-in-Germany	D-40468 Duesseldorf	Germany	E13
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Taisei Co., Ltd.	5770011 Osaka	Japan	E18
Techno Eye Inc.	134-0087 Tokyo	Japan	E19
Zoz Group	D-57482 Wenden	Germany	E20

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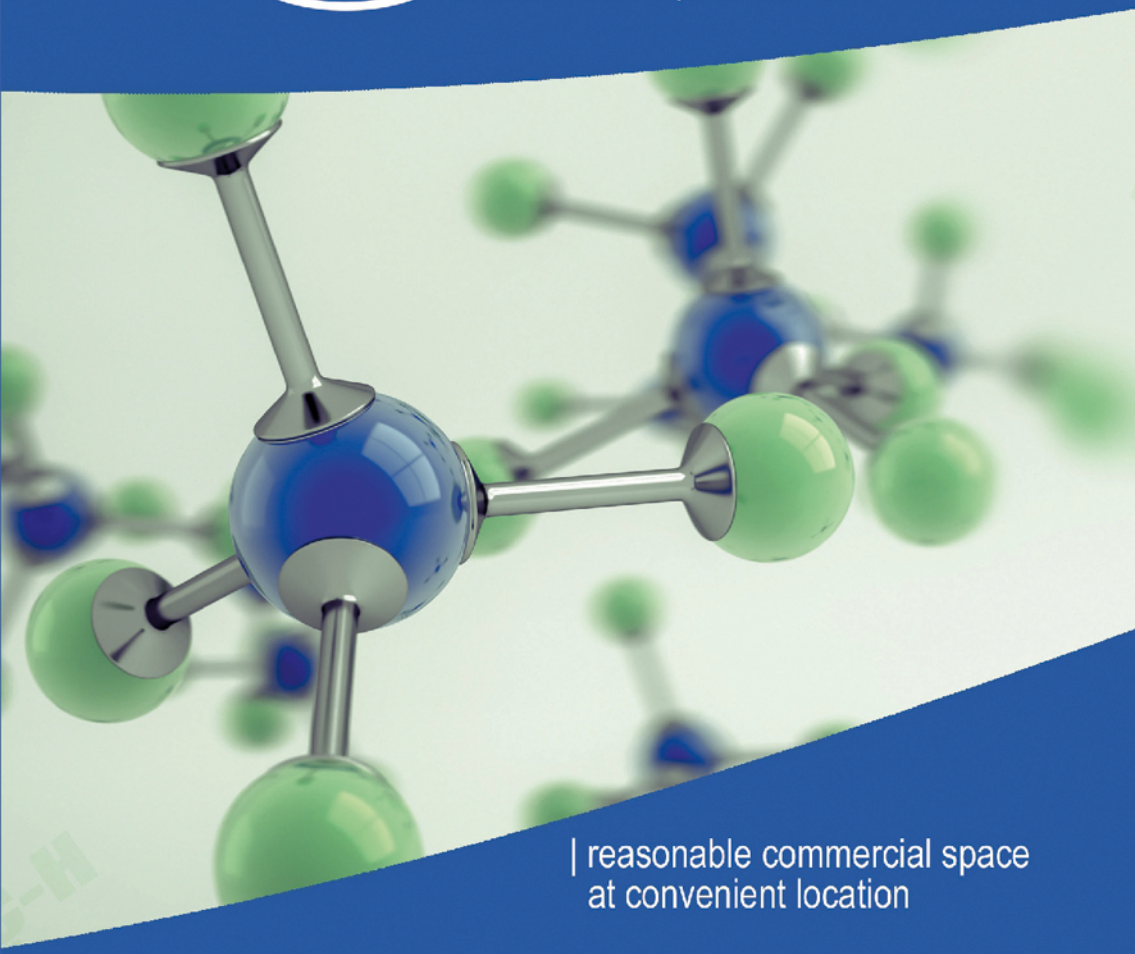

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notes

OZ-Workshop 2015

at Solar Applied Materials Technology Corp.

April 23, 2015, Taiwan

With respect to speakers face-pic and abstract we apologize for any missing data that has not been available at copy deadline.

As for the proceedings, everything will be included that will be received before January 11, 2015.

OZ-Workshop 2015

at University of California, Berkeley

May 15, 2015, USA

www.zoz.de

Following principle and goal of the German-Japanese Symposia,
OZ-16 will be held from March 6-8, 2016 again in Wenden, Germany

Please mark your calendar already and let´s meet again in Germany next year