Monday, 6th December

09:10 h
Where did the fifty-year search for laser crystals and ceramics take us? (invited)
Alexander A. Kaminskii
Russian Academy of Sciences, Institute of Crystallography, Moscow, Russia

During half a century history of the laser era the search for laser crystals and ceramics has brought many important results. They have largely determined the development and formation of laser physics. Applications of laser crystals and ceramics are well known. Some of them (mainly with Ln3+ lasants) in the report would be given special attention. Unfortunately, the further success of the search and application of laser crystal materials prevented a number of issues that have not been fully resolved over the years. Some of these problems will be considered in the report taking into account modern trends of laser physics and nonlinear optics.

09:35 h
High energy and high average power laser by using a composite ceramic (invited)
Junji Kawanaka1, Hiroaki Furuse2, Takuya Nakashima1, Yasuki Takeuchi1, Akira Yoshida1
1Osaka University, Institute of Laser Engineering, Japan, 2Osaka University, Institute of Laser Technology, Japan

Diode-pumped solid-state laser has been developed by using a cryogenic composite ceramics. A novel laser amplifier arrangement of total-reflection active-mirror was proposed for high-pulse-energy and high-average-power simultaneously. The regenerative amplifier was demonstrated and a joule-class multi-pass amplifier is under construction.

10:00 h
Thin-disk laser properties and photoconductivity of single crystalline and ceramic Yb:YAG
Susanne T. Fredrich-Thornton, Ulrike Wolters, Günter Huber, Klaus Petermann
University of Hamburg, Institute of Laser-Physics, Germany

A decrease in laser efficiency with inversion density is found for Yb:YAG thin-disk lasers. Ceramic samples seem less affected compared to single crystals. The differences in laser performance of the two material classes are discussed together with photoconductivity results.

10:20 h
High efficiency lasing using 10% Yb3+ doped Lu2O3 ceramics
Jas Sanghera, Woohong Kim, Guillermo Villalobos, Jesse Frantz, Brandon Shaw, Fred Kung, Ishwar Aggarwal
Naval Research Laboratory, Washington, DC, USA

We demonstrate lasing at 1080 nm in 10% Yb3+ doped Lu2O3 transparent ceramics with an output power greater than 8 Watts and a slope efficiency of approximately 60%. We will describe the synthesis and properties of the heavily doped Lu2O3 ceramics.

11:10 h
Characterization of absorption losses in YAG laser ceramics (invited)
Romain Gaume, Bob Byer
Stanford University, Ginzton Laboratory, Standford, CA, USA

We will report on comparative thermalized absorption measurements obtained in various YAG transparent ceramics and single-crystals. Correlations with lattice defects and impurities content will be discussed.

11:35 h
Effect of grain boundaries on the thermo-optical properties of Nd3+:Y3Al5O12 highly transparent ceramics as a function of temperature
Antonio Benayas1, Daniel Jaque1, Jose Garcia-Sole1, Tomaz Catunda2, Alexander A. Kaminskii3, Carlos Jacinto3
1Universidad Autónoma de Madrid, Departamento de Física de los Materiales, Madrid, Spain, 2Universidade de São Paulo, Instituto de Física de São Carlos, São Carlos, Brazil, 3Russian Academy of Sciences, Institute of Crystallography, Moscow, Russia

The effect of grain boundaries on the thermo-optical properties as a function of low temperature (90-300K) was investigated in Nd:YAG ceramics with grain-size of 2, 10, and 18 µm and compared with the single crystal (all with 1at.% of Nd3+).

11:55 h
Time-resolved luminescence characteristics of Ce and Nd doped YAG ceramics obtained by high pressure technique
Larisa Grigorjeva1, D. Millers1, K. Smits1, D. Jankovicka1, W. Lojkowski2, Anna Swiderska Sroda1, Wieslaw Strék3, P. Gluchowski3
1University of Latvia, Institute of Solid State Physics, Riga, Latvia, 2Polish Academy of Sciences, Institute of High Pressure Physics, Warsaw, Poland, 3Polish Academy of Sciences, Institute of Low Temperature and Structure Research, Wroclaw, Poland

Transparent YAG ceramic were prepared by the synthesis under high pressure (up 8 GPa) at relative low temperature (High Pressure Low Temperature - HPLT). The luminescence properties were studied before and after ceramics annealing at different temperatures. A special attention is given to defect nature and defect annealing processes since the defects induced under high pressure greatly reduce the luminescence decay time and ceramic transparency.

12:15 h
Migration-accelerated luminescence quenching in spherical nanoparticles
Tasoltan Basiev, Nikolay Glushkov, Irina Basieva
Russian Academy of Sciences, Prokhorov General Physics Institute, Moscow, Russia

We show that supermigration quenching kinetics in spherical nanoparticles can be adequately described by two stages exponential decay with the maximal rate somewhat lesser than in bulk case, and second, Foerster-like stage proportional to the exponent of square root of time.

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13:35 h
Ceramic materials for visible solid-state lasers (invited)
Ulrich Weichmann, Uwe Mackens, H. Moench, J. Opitz
Philipps Technologie GmbH Forschungslaboratorien, Aachen, Germany
For consumer applications of lasers, ceramic laser materials play an important role with respect to the integration aspects of the laser setup. In this contribution we will present results from our work on integrated green efficient lasers for projection systems.

14:00 h
Nd\textsuperscript{3+}-doped Ba(Zr\textsuperscript{4+},Mg\textsuperscript{2+},Ta\textsuperscript{5+})O\textsubscript{3} ceramics as laser materials (invited)
Satoshi Kuretake\textsuperscript{1}, N. Tanaka\textsuperscript{1}, Y. Kintaka\textsuperscript{1}, K. Kageyama\textsuperscript{1}, H. Kurokawa\textsuperscript{2}, M. Tokurakawa\textsuperscript{2}, A. Shirakawa\textsuperscript{2}, Ken-ichi Ueda\textsuperscript{1}, Alexander A. Kaminskii\textsuperscript{3}
\textsuperscript{1}Murata Manufacturing Co., Ltd, Japan, \textsuperscript{2}University of Electro-Communications, Institute for Laser Science, Shimane, Japan, \textsuperscript{3}Russian Academy of Sciences, Institute of Crystallography, Moscow, Russia
We report transparent Nd\textsuperscript{3+}-doped Ba(Zr,Mg,Ta)O\textsubscript{3} (Nd:BZMT) ceramic as laser materials. The results of the structural analyses and the fluorescence properties in Nd:BZMT fabricated by adjusting the BZMT composition in order to substitute Nd dopants at different crystal sites will be reported.

14:25 h
Transparent Nd:YAG ceramics fabricated by solid-state reaction method
Vladislav A. Shitov, V.V. Osipov, V.I. Solomono

Russian Academy of Sciences (Ural Division),
Institute of Electrophysics, Yekaterinburg, Russia

Transparent Nd:YAG ceramics were fabricated by solid-state reaction method using high-purity Nd:Y\textsubscript{2}O\textsubscript{3} and Al\textsubscript{2}O\textsubscript{3} powders fabricated by laser evaporation method. Powders were mixed without additives, uniaxial pressed and sintered under vacuum. The optical transmittance of synthesized ceramic sample (3 mm thick) was 81.35\% at 1064 nm.

15:15 h
Segregation phenomenon of rare earth dopants in ceramics (invited)
George Boulon\textsuperscript{1,2}, W. Zhao\textsuperscript{1,3}, S. Anghel\textsuperscript{1,4}, C. Mancini\textsuperscript{1}, D. Amans\textsuperscript{1}, T. Epicier\textsuperscript{5}, V. Chani\textsuperscript{2}, A. Yoshikawa\textsuperscript{2}
\textsuperscript{1}University of Lyon, Physical Chemistry of Luminescent Materials Lab, Lyon, France, \textsuperscript{2}IMRAM, Tohoku University, Sendai, Japan, \textsuperscript{3}University of Science and Technology of China, Anhui, China, \textsuperscript{4}Institute of Applied Physics, Chisinau, Republic of Moldova, \textsuperscript{5}University of Lyon, Matériaux, Ingénierie et Sciences (MATEIS), Villeurbanne, France
We analyse segregation phenomenon of Ce\textsuperscript{3+} (first position) and Yb\textsuperscript{3+} (last position) rare earth dopants in grain and grain boundaries of oxide optical ceramics from imaging confocal microscopy and transmission electronic microscopy. Interpretation is related with growth from liquid phase.
Up-conversion phenomena in RE\textsuperscript{3+}-doped transparent nanoceramics (invited)

Wiesław Stręk\textsuperscript{1}, P. Gluchowski\textsuperscript{1}, R. Wiglusz\textsuperscript{1}, D. Hreniak\textsuperscript{1}, O. Ignatenko\textsuperscript{2}

\textsuperscript{1}Polish Academy of Sciences, Institute of Low Temperature and Structure Research, Wroclaw, Poland, \textsuperscript{2}National Academy of Sciences, Scientific-Practical Materials Research Centre, Minsk, Belarus

The double Er\textsuperscript{3+} and Yb\textsuperscript{3+} doped YAG, KYF\textsubscript{4} and MgAl\textsubscript{2}O\textsubscript{4} transparent nanocrystalline ceramics were sintered under high pressure at relatively low temperature. The comparative studies of up-conversion fluorescence of Er\textsuperscript{3+} after direct excitation of Yb\textsuperscript{3+} in different crystalline hosts was performed. The effect of applied sintering pressure on up-conversion intensities in different nanoceramics was observed. The dependence of up-conversion intensity on incident light excitation power was studied. It was found the overall fluorescence characteristics of Er\textsuperscript{3+}.

- continuation of column 1 -

A relative distribution of fluorescence bands (green/red ratio) was dependent on incident light intensity. This dependence could be correlated with the averaged temperature of nanoceramic. It was suggested that such up-conversion nanoceramics could be applied in high temperature thermometry.

Thermo-optical measurements of ytterbium doped sesquioxides ceramics

Vanessa Cardinali\textsuperscript{1}, Emilie Marmois\textsuperscript{1}, Bruno Le Garrec\textsuperscript{1}, Gilbert Bourdet\textsuperscript{2}

\textsuperscript{1}CEA-CESTA (Centre d’Etudes Scientifiques et Techniques d’Aquitaine), Barp, France, \textsuperscript{2}LULI, École Polytechnique, Palaiseau, France

Measurements of the key thermo-optical properties (thermal conductivity, thermal expansion coefficient and thermo-optical coefficient \textit{dn/dT}) of Yb\textsuperscript{3+} in sesquioxides ceramics Y2O\textsubscript{3}, Sc2O\textsubscript{3}, Lu2O\textsubscript{3} are done at room and cryogenic temperatures. We show that laser performances are improved at low temperatures.

Transparent ceramics for photonic applications

H. Yagi, T. Yanagitani

Konoshima Chemical Co. Ltd., Takuma Works, Kagawa, Japan

Since 1980’s, we have been developing various transparent ceramics for photonic applications, such as YAG, LuAG, TGG, disordered garnet, sesquioxide etc. These materials are suitable for photonic applications, not only laser gain medium, but also for scintillator, phosphor, optical window and so on. This presentation will briefly review the state-of-the-art optical and physical properties of these ceramics.
Tuesday, 7th December

09:00 h
Optical properties of transparent GdYAG:Ce ceramics for white LED (invited)
Setsuhisa Tanabe, Shotaro Nishiura
Kyoto University, Graduate School of Human and Environmental Studies, Japan
Transparent Ce\textsuperscript{3+}-doped GdYAG ceramics were fabricated by the vacuum sintering of powders prepared by co-precipitation method. By exciting with a blue LED, the ceramics on top showed excellent luminous efficacy and good color rendering as a white LED. In the PL spectra, the wavelength shift of the Ce\textsuperscript{3+}-5d-4f transition was observed by Gd substitution of Y-site, as well as in the PLE spectra.

09:25 h
Microstructurization techniques for the development of miniaturized Nd:YAG ceramic lasers (invited)
D. Jaque\textsuperscript{1}, A. Benayas\textsuperscript{1}, W. F. Silva\textsuperscript{2}, C. Jacinto\textsuperscript{2}, J. Vazquez de Aldana\textsuperscript{2}, G.A. Torchia\textsuperscript{2}, A.A. Kaminskii\textsuperscript{2}
\textsuperscript{1}Universidad Autónoma de Madrid, Dep. de Física de Materiales, Spain, \textsuperscript{2}Universidade Federal de Alagoas, Instituto de Física, Brazil, \textsuperscript{3}Heriot-Watt University, School of Engineering and Physical Sciences, UK, \textsuperscript{4}Universidad de Salamanca, Dep. de Física Aplicada, Spain, \textsuperscript{5}Shandong University, School of Physics, Jinan, P. R. China, \textsuperscript{6}CONICET-CIC, Centro de Investigaciones Ópticas, La Plata, Argentina
The last developments achieved in the micro-structurization of Nd:YAG ceramic lasers for their incorporation in active photonic devices will be discussed. We will pay special attention to the fundamentals of the different techniques used up to now.

09:50 h
Preparation of YAG:Ce-dispersed transparent CaF\textsubscript{2} ceramics and application to white LEDs
Hitoshi Ishizawa, Yoshinobu Ezura
Nikon Corporation, Materials & Advanced Research Laboratory, Kanagawa-ken, Japan
We have developed transparent CaF\textsubscript{2} ceramics. In this study, YAG:Ce-dispersed CaF\textsubscript{2} ceramic phosphors were prepared for white LEDs. The characteristics and optical properties of the ceramics will be reported.

11:00 h
Transparent ceramics for optical and fluorescence applications (invited)
Yasmine Menke
SCHOTT AG, Corporate Research and Technology Development, Mainz
In this paper new developments in the fabrication of high refractive index materials with cubic crystal structure as possible matrix material for rare-earth activated compounds are described. Related applications in both optical and fluorescence application fields are illustrated.

11:25 h
Anisotropic ceramics as a next generation laser (invited)
Takunori Taira
Institute of Molecular Science (IMS), Laser Research Center for Molecular Science, Okazaki, Japan
Transparent polycrystalline ceramics for laser applications have been demonstrated to offer tremendous processing and design advantages relative to Czochralski-grown single crystals. After the review of conventional ceramic lasers, we'd like to discuss the next generation of ceramic lasers based on the anisotropic ceramics.

11:50 h
Spectroscopic and oscillation properties of Nd\textsuperscript{3+} ions in newly developed SrF\textsubscript{2} laser ceramics
Maxim E. Doroshenko, T. T. Basiev, V.A. Konyushkin, D.V. Konyushkin, A.N. Nakladov, V.V. Osiko
Russian Academy of Sciences, Prokhorov General Physics Institute, Moscow, Russia
SrF\textsubscript{2} laser ceramics were developed using hot pressing technique. Oscillation spectrum of Nd\textsuperscript{3+} ions in SrF\textsubscript{2} ceramics was found to change with laser diode pumping wavelength. Laser oscillations of Nd\textsuperscript{3+} ions in SrF\textsubscript{2} ceramics under laser diode pumping for different pumping geometries were obtained with slope efficiency up to 19%.

12:10 h
The microstructure of erbium-ytterbium co-doped oxyfluoride glass-ceramic optical fibers
Elżbieta Augustyn, Michał Żelechower
Silesian University of Technology, Department of Materials Science, Poland
Er\textsuperscript{3+} and Yb\textsuperscript{3+} co-doped oxyfluoride glass-ceramic fibers have been obtained by controlled crystallization of the glass fibers. Glasses of the following composition 48SiO\textsubscript{2}-11Al\textsubscript{2}O\textsubscript{3}-7Na\textsubscript{2}CO\textsubscript{3}-10CaO-10PbO-10PbF\textsubscript{2}-3YF\textsubscript{3}-1ErF\textsubscript{3} were fabricated from high purity commercial chemicals. The fabricated glass preforms were drawn into glass fibers. The transparent oxyfluoride glass-ceramic fibers were obtained by heat treatment of glass fibers. High-resolution electron microscopy (HRTEM) and X-ray diffraction (XRD) allowed to demonstrate their mixed amorphous-crystalline microstructure and nano-crystals of size even below 10 nm have been identified as Er\textsubscript{5}F\textsubscript{10}Si\textsubscript{6}, Pb\textsubscript{5}Al\textsubscript{3}F\textsubscript{19}, and Er\textsubscript{3}F\textsubscript{14}Si\textsubscript{10}.
Advance Programme

Tuesday, 7th December

13:30 h POSTER SESSION

**Transparent LuAG:Nd ceramics as alternative laser gain media**

Tobias Dierkes, Benjamin Herden, Thomas Jüstel
Münster University of Applied Sciences, Department of Chemical Engineering, Steinfurt, Germany

The continuous rise to prominence of optically transparent ceramics is mainly due to their many advantages in comparison to single crystals. In this study the garnet system LuAlO\(_3\) \((\text{LuAG})\) was examined and it was tried to obtain transparent ceramics with minimized scattering at grain boundaries and cavities thus with a high theoretical density (>99.9%).

**On the host lattice LiYF\(_4\) doped by trivalent praseodymium as a transparent ceramic laser material**

Benjamin Herden, Thomas Jüstel
Münster University of Applied Sciences, Department of Chemical Engineering, Steinfurt, Germany

The study deals with the synthesis of LiYF\(_4\)-based laser ceramics, doped by Praseodymium, as converter materials for blue lasers. Different preparation methods were reviewed to obtain ceramics with densities close to the theoretical value. Achieved translucent ceramics were characterised by optical spectroscopy.

**On the correlation between the composition of garnet type materials and their photoluminescence properties**

Arturas Katelnikovas\(^1\), Dominik Uhlich\(^1\), Helga Bettentrup\(^1\), Julian Plewa\(^1\), Aivaras Kareiva\(^2\), Thomas Jüstel\(^1\)

\(^1\)Münster University of Applied Sciences, Department of Chemical Engineering, Steinfurt, Germany, \(^2\)Vilnius University, Department of General and Inorganic Chemistry, Vilnius, Lithuania

In the present study, the luminescent properties of rare earth ion doped garnet type host lattices are discussed as a function of their composition and thus the chemical details of the crystal structure. The results will be summarised and correlated to the crystal field strength and centroid shift governing the position of the crystal-field components of the excited state configuration of the activators Ce\(^{3+}\), Pr\(^{3+}\), and Nd\(^{3+}\).

**Electrophoretic deposition of cylindrical bodies from nano-alumina dispersions**

Joanna Micior, Michael Bredol
Münster University of Applied Sciences, Department of Chemical Engineering, Steinfurt, Germany

Electrophoretic deposition (EPD) is mostly used for the fabrication of ceramic green layers. Here we present a method to fabricate dense cylindrical green bodies on stainless-steel electrodes using a removable plastic form. After defining the optimal electrophoretic conditions (methods of particle charging, stabilization of colloids in aqueous media, pulsed DC to obtain bubble-free deposits) nano-alumina dispersions were deposited. The results confirm that uniform and dense green bodies can be prepared from commercial Al\(_2\)O\(_3\) powder.

**Ce\(^{3+}\) sensitized Nd\(^{3+}\) emission in garnet type structures**

Stephanie Möller, Alexander Hoffmann, Thomas Jüstel
Münster University of Applied Sciences, Department of Chemical Engineering, Steinfurt, Germany

We will discuss influences of changes in the crystal field on the energy transfer from Ce\(^{3+}\) to Nd\(^{3+}\) and thus on the luminescence properties of Nd\(^{3+}\) incorporated in garnets co-doped with Ce\(^{3+}\).

**On the correlation between the composition of garnet type materials and their photoluminescence properties**

Arturas Katelnikovas\(^1\), Dominik Uhlich\(^1\), Helga Bettentrup\(^1\), Julian Plewa\(^1\), Aivaras Kareiva\(^2\), Thomas Jüstel\(^1\)

\(^1\)Münster University of Applied Sciences, Department of Chemical Engineering, Steinfurt, Germany, \(^2\)Vilnius University, Department of General and Inorganic Chemistry, Vilnius, Lithuania

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**Neodymium-doped 8/65/35 PLZT ceramics for photonic applications, obtained by different sintering methods**

Malgorzata Plonska\(^1\), Wojciech A. Pisarski\(^2\), Lukasz Cierni\(^3\)

\(^1\)University of Silesia, Faculty of Computer and Materials Science, Sosnowiec, Poland, \(^2\)University of Silesia, Faculty of Mathematics, Physics and Chemistry, Katowice, Poland

Optical properties of Nd\(^{3+}\) ions in several host matrices such as glasses and transparent glass-ceramics depend on chemical composition, heat treatment conditions and preparation methods. In this work the influence of neodymium concentration (0-1at.%) and sintering conditions on 8/65/35 PLZT:Nd\(^{3+}\) ceramics were studied. All ceramic powders were synthesized by MOM technique and subsequently sintered by free sintering and hot uniaxial pressing method. Optimal conditions of PLZT:Nd\(^{3+}\) preparation as well as activator concentration were determined in relation to photonic applications.

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Tuneable transparency in hydroxyapatite by varying sintering parameters and Strontium-doping

Syed Tofail, Abbasi Gandhi, Andrea Schattle, Jacek Zeglinski, Olga Korostynska, Michael Bredoi

University of Limerick, Materials and Surface Science Institute, Limerick, Ireland, Münster University of Applied Sciences, Department of Chemical Engineering, Steinfurt, Germany

We demonstrate tuneable optical transparency in hydroxyapatite by varying sintering parameters and Strontium doping. This tuneable optical transparency along with its novel electrical properties can open up a number of important optical, opto-electrical and laser applications, additionally to its conventional bio-applications.

A fabrication process for Yb:YAG Ceramic and its lasing property

Jian Zhang, Zong, Weide Luo, Jianpeng Qin, Hao Yang, Zhihong Cong, Changwen Xu, Shiwei Wang

Nanyang Technological University, Singapore, Chinese Academy of Sciences, Shanghai Institute of Ceramics, Shanghai, P.R China

Vacuum reactive sintering method was employed to fabricate laser quality transparent Ytterbium doped yttrium aluminum garnet (Yb:YAG) polycrystalline ceramics. An uncoated 940 nm diode laser. Under a maximum incident power of 11.79 W, 1.65 W output power was produced at a wavelength of 1030 nm, which corresponds to a 19.6% slope efficiency.

High quality Nd:YAG transparent ceramics were fabricated by reactive sintering method under vacuum using both SiO2 and MgO as compound sintering aids. The transmittance of the ceramic was still 82% at 400nm.

Peculiarities of nano-YAG synthesized by a glycothermal method

Mark Vorsthove, Thanh Huu Tran, Hellmut Eckert, Ulrich Kynast

Münster University of Applied Sciences, Department of Chemical Engineering, Steinfurt, Germany

YAG-nanoparticles, synthesized via the so called glycothermal method, were examined by size, optical properties and with solid state NMR-Techniques. Special attention was paid to the particle surface and the stability of the emission under irradiation.

Fabrication and properties of highly transparent Er:YAG ceramics

Jian Zhang, Zong, Weide Luo, Jianpeng Qin, Hao Yang, Zhihong Cong, Changwen Xu, Shiwei Wang

Nanjing University of Technology, Nanjing, China

Highly transparent Er:YAG ceramics with different doping concentration were fabricated by a solid-state reactive sintering method using commercial Al2O3, Y2O3 and Er2O3 powder as starting materials. For 3 mm thickness samples, the in-line transmittances at the wavelength of 1100 nm and 400 nm were about 84% and 82% respectively.

High pressure sintering technique: effect of grain size and strains.

A. Bednarkiewicz, A. Lukowiak, P. Głuchoński, W. Stręk

Polish Academy of Sciences, Institute of Low Temperature and Structure Research, Wrocław, Poland

Eu3+:MgAl2O4 nanoceramics have been obtained by a high temperature/high pressure sintering process (LTHP). The structural properties have been studied by X-ray diffraction (XRD). The grain sizes and R.M.S micro-strains have been calculated by Rietveld method based on the XRD patterns. The photoluminescent properties of nanoceramics were investigated by excitation and emission spectroscopy at room and low temperature (77 K). The f-f transitions characteristic for Eu3+ ion were observed and emission lifetimes were measured. The Judd–Ofelt theory has been performed to explain a detailed analysis of luminescence spectra.
Tuesday, 7th December

15:00 h  
Strength and strengthening of polycrystalline (ceramic) laser components (invited)  
Yehoshua Shimony¹,², Revital Feldman¹  
¹Soreq NRC, Applied Physics Division, Yavne, Israel, ²Ben-Gurion University of the Negev, Department of Materials Engineering, Beer-Sheva, Israel  
Crystalline laser components may fracture under high thermally induced stress. In the present paper, ways to evaluate the tensile strength of crystalline and poly-crystalline laser components will be discussed, as well as paths to enhance its strength.

15:25 h  
Specificity of thermal effects in laser ceramics as compared to single crystals: theory and experiments (invited)  
Efim Khazanov  
Institute of Applied Physics, Nizhny Novgorod, Russia  
We review theoretical predictions and experimental confirmations of strong statistical dispersion of thermal lensing and thermally induced depolarization in ceramics. This effect is specific to ceramics and has no analogues either in glasses or in single crystals.

15:50 h  
Simple method to join YAG ceramics and crystals  
V.B. Kravchenko², S. N. Bagayev¹, A. A. Kaminskii², Y. L. Kopylov², I. M. Kotelyanskii³  
¹Russian Academy of Sciences, Institute of Laser Physics SB, Novosibirsk, Russia, ²Russian Academy of Sciences, Institute of Crystallography, Moscow, Russia, ³Russian Academy of Sciences, Institute of Radio Engineering and Electronics named after V.A. Kotel'nikov, Fryazino, Russia  
Method to join samples of YAG ceramics and crystals with flat polished surfaces together with no visible border between the samples includes deposition of SiO2 layer(s) on the surfaces to be joined and heating the joined samples above 1700 oC.
09:25 h  
**Towards ultra high intensity lasers (invited)**  
Ken-ichi Ueda  
*Institute for Laser Science, Univ. of Electro-Communications, Chofu, Tokyo, 182-8585 Japan*  
To discover high field sciences, ultra-high power solid state lasers, 100 fs, 15 kHz, and 3 MW in average power are required. New concepts proposed for ICFA (International Committee on Future Accelerators) and ICIUL (International Committee of Ultra-high Intensity Lasers) will be discussed in the meeting.

09:50 h  
**Improvements in the processing of Yb:YAG ceramic materials**  
Marina Serantoni¹, Laura Esposito¹, Andreana Piancastelli¹, Daniele Alderighi², Angela Pirri²  
¹ISTEC-CNR, Istituto di Scienza e Tecnologia dei Materiali Ceramici, Faenza (RA), Italy  
²IFAC-CNR Istituto di Fisica Applicata “Carrara”, Sesto Fiorentino (FI), Italy  
This study focuses on the optimization of the powder processing of Yb:YAG ceramics. An innovative spray drying process of solvent-based suspensions is adopted for the preparation of ready-to-press powders. The influence of the experimental conditions on morphology of granulated powders, on microstructure evolution during sintering and transparency, is described.

10:10 h  
**Processing control for fabricating high quality Nd:YAG ceramics (invited)**  
Jian Zhang¹,², Xianpeng Qin², Hao Yang², Dewei Luo², Hua Gong², Dingyuan Tang², Jan Ma³, Shiwai Wang⁴  
¹Nanyang Technological University, Temasek Laboratories, Singapore, ²Chinese Academy of Sciences, Shanghai Institute of Ceramics, P.R China, ³Nanyang Technological University, School of Electronics and Electrical Engineering, Singapore  
In this research, the effects of stoichiometry, sintering aids, and sintering conditions on microstructure and further the optical quality of the sintered ceramics will be discussed. By optimizing the processing parameters, high optical quality YAG ceramics are fabricated successfully.

11:05 h  
**Growth of optical grade yttrium oxide single crystal via ceramic technology**  
Maxim Ivanov, Irina Vyukhina, Vladimir Khristov  
*Russian Academy of Sciences, Institute of Electrophysics, Ekaterinburg, Russia*  
The presentation deals with growth of Nd³⁺:Y₂O₃ (NDY) single crystal via ceramic process. Samples of NDY single crystal were produced. Defects formed in the samples were investigated. Conditions that are necessary for abnormal grain growth in yttrium oxide as well to grow the optical grade single crystal are discussed.

11:25 h  
**Optical ceramics for solid state lighting (invited)**  
George Wei, M. Raukas  
*Osrarn Sylvania, Beverly, MA, USA*  
Solid-state lighting utilizes new optical ceramics such as Ce-doped garnets to either combine emissions from the LED and ceramic for high-brightness white light or fully convert to pure color. Precision fabrication achieves efficient luminescent ions, host lattice, and favorable absorption/emission.

11:50 h  
**The influence of anions during micro-jet-reactor precipitation of YAG-powders on powder properties and resulting microstructure**  
Daniel Ganzer¹, Jan Werner¹, Ralf Diedel¹, Lothar Ackermann², Mathias Germann²  
¹Research Institute for Inorganic Materials – Glass/Ceramics GmbH, Hoehr-Grenzhausen, Germany, ²Research Institute for Mineral and Metal Materials – Gemstones/Noble Metals GmbH, Idar-Oberstein, Germany  
Nan-scaled YAG-precursor powder with high chemical purity is produced by Micro-Jet-Reactor precipitation technique. The influence of the anion component during precipitation on powder properties is clarified and the resulting microstructure of the vacuum sintered and hot isostatic pressed ceramics is described.

13:30 h  
**Fabrication of transparent nanoceramics through controlled amorphous crystallization**  
Jiangtao Li, Lin Mei, Guanghua Liu  
*Chinese Academy of Sciences, Technical Institute of Physics and Chemistry, Beijing, P. R. China*  
Transparent LaAlO₃/ZrO₂ and YAG/HfO₂ composite nanoceramics have been prepared through viscous sintering and controlled crystallization. By this method, the densification can be separated from grain growth and thus nanoceramics can be produced.
Wednesday, 8th December

13:50 h
Transparent hydroxyapatite ceramics with piezo and pyroelectricity
Syed A. M. Tofail, Abbasi A. Gandhi, Olga Korostynska, Colm Johnson
University of Limerick, Materials and Surface Science Institute, Limerick, Ireland
We report high level of optical transparency and significant piezo and pyroelectric effect on spark plasma sintered hydroxyapatite ceramics as well as their mass production technique. These new properties in hydroxyapatite can open up important bio-optic applications of hydroxyapatite in addition to its conventional applications.

14:10 h
Phase controlled stimulated Brillouin scattering phase conjugate mirror and its application to a coherent four-beam combination (invited)
Jin Hong Kong, Sangwoo Park, Seongwoo Cha
Korea Institute of Science and Technology, Daejeon, Republic of Korea
Coherent four-beam combination using the self-phase controlled stimulated Brillouin scattering phase conjugate mirror is constructed. With the wavefront dividing method and the amplitude dividing method, the phase fluctuations between the SBS beams are well-stabilized when the amplifiers are operating.

14:35 h
Characterisation of optical components by means of time-of-flight secondary ion mass spectrometry
Birgit Hagenhoff, Elke Tallarek, Reinhard Kersting
Tascon GmbH, Münster, Germany
For development or failure analysis of optical materials a sensitive analytical technique is required. We will show that ToF-SIMS (Time-of-Flight Secondary Ion Mass Spectrometry) is a well suited screening tool for chemical characterization directly at the solid surface, in deeper layers and in a complete 3-dimensional volume.