

COORDINATING TECHNICAL COMMITTEE

ANNUAL REPORT 2022

CTC CHAIR



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CTC MEMBERS



Russell Hand
Secretary



Bernhard Hehlen
Basic Science



Kiyoharu Tadanaga
Characterisation



Mathieu Hubert
Vice Chair



Tolga Uysal
Glass Production



**Ana Candida
Rodriguez**
Education



Yuanzheng Yue
Applications

Executive Summary

2022 saw a return to activities and celebration of the International Year of Glass. TC members attended the Opening Ceremony in the UN in Geneva (February), International High-Tech Industrial Congress in Shanghai (April), the annual meeting in Berlin (July) and the closing ceremonies in New York and Tokyo (December).

Business meetings took place online. In addition to these meetings, teleconferences amongst the CTC members were held bimonthly. The meetings focused on Turner Award, Best Web site and CTC fund. There is some hesitancy from TCs to prepare annual reports while the ICG membership situation remains unresolved.

The main actions performed by TCs before the COVID-19 were Round Robin tests and holding conferences and symposiums. Since the COVID-19 pandemic hindered all activities. 2022 has seen increased activity in TCs, and a refreshing of membership. TC members contributed constructively in the debate on the ICG2030 project and restructuring of ICG membership at the Berlin Council Meeting.

1. ICG Schools

In 2022 the ICG Summer School normally held in Montpellier, France was relocated to Berlin, Germany and held in the week prior to the ICG Congress Berlin. The School was hosted at BAM with Ralf Müller acting as the local host. 28 students attended with lectures given by the Summer School team supplemented by Corinne Claireaux, Ralf Müller and Erik Muijjsenbergs as guest speakers.

2. Activities of TCs (highlights from Annual Reports)

Individual TCs activities were below:

TC01: Communications The chair of TC01 transferred to Ana Candida Rodrigues.

TC02: Durability, Characterisation

Working on proficiency tests, method development and certification.

TC03: Glass Structure and Properties

No report due to discontent at ICG2030 plans

TC04: Biomedical glasses

At least 10 joint publications between TC members in 2022.

IYOG2022: Delia Brauer and Julian Jones wrote a chapter on "Glasses in Healthcare" for the ICG IYOG book. Julian Jones gave a Keynote talk at the IYOG opening ceremony in Geneva and Delia Brauer gave Keynote lecture at the closing ceremony in Tokyo. Prof. Boccaccini's group curated a display window in Erlangen city center in June, highlighting the application of bioactive glasses in bone regeneration and wound healing.

Ashutosh Goel organized the 2022 Glass & Optical Materials Division Meeting of the American Ceramic Society in Baltimore, MD, USA, in May 2022

Aldo Boccaccini was a member of the scientific organizing committee for ICG 2022 and co-organized the symposium "Emerging Glass Applications and Application-related Challenges". He co-chaired the symposium "Glasses in Healthcare".

E Vernè and J Massera are both participants of an EU Marie Curie Innovative Training Network.

Awards: Prof. Chengtie Wu was awarded 2022 Young Scientist of International Union of Materials Research Society (IUMRS)

Prof. Qiang Fu Presented the Varshney Frontier of Glass Technology Lecture at GOMD 2022

Prof. Aldo R. Boccaccini elected Fellow of the European Academy of Sciences.

Plan for 2023: TC04 gratefully acknowledges €6000 in CTC funding to perform a cell tests study on bioactive glasses. The idea is to establish a unified cell culture protocol to test BG and BG-based materials for "osteostimulation", i.e. *in vitro* stimulation of bone cells through ions released from the glass. Validation of this proposed new protocol will be through Round Robin testing, in which TC04 member groups participate. Owing to the COVID-19 pandemic the start of the testing has been delayed. Furthermore, in 2021 D. Brauer resigned from the chairing the TC04 and the Jonathan Massera became chair. The round Robin testing is planned to start in 2023 and a meeting will be held soon to plan the work.

TC05: Waste Vitrification

Dr. A. Goel (Chair) represented the TC05 at the closing ceremony of the International Year of Glass 2022 (IYOG 2022) at the United Nations Headquarters in New York on December 13, 2022. Dr. Goel was accompanied by his graduate students working in the field of nuclear waste vitrification.

The members of TC05 from Spain, under the leadership of Dr. Jesus M. Rincon, organized several activities during 2022 to celebrate the IYOG 2022. This includes several short courses, workshops, and invited lectures (online and in-person).

Dr. A. Goel (Chair) and Dr. C. Lonergan (Vice-Chair) of TC 05 organized the 2022 Glass & Optical Materials Division (GOMD) Meeting of the American Ceramic Society from May 22-26, 2022, in Baltimore, MD. The meeting had a dedicated session on nuclear waste vitrification.

The members of TC05 from the United States delivered several online/in-person lectures on nuclear waste vitrification/management to commemorate the IYOG 2022.

The TC05 members met at the 26th International Congress on Glass (ICG) in Berlin, Germany during July 2022. The aim was to rejuvenate the collaborative activity among TC05 members after the COVID-19 pandemic.

Several TC05 members delivered invited/oral presentations at the 26th ICG meeting in Berlin during July 2022.

Started a LinkedIn group entitled, "International Commission on Glass: TC05 Waste Vitrification." The group connects the students, researchers, engineers, and policy makers in the field of waste vitrification and provides them a platform to share their research, ideas, and updates.

Joint ICTP-IAEA International School on the Physical Basis for Radionuclide Migration (Storage, disposal and contaminated sites), (smr 3751), 7-11.11.2022, The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy. **Co-Director:** Dr. M. Ojovan
Website: <https://indico.ictp.it/event/9841/>.

M. Ojovan, "Glass Composite Materials as Advanced Wasteforms for Nuclear Waste Immobilization," Spent Nuclear Fuel & Waste Form Performance Under Geological Disposal Conditions Workshop, University of Huddersfield, Huddersfield, United Kingdom, 11 – 13 July 2022 (Invited talk).

The TC05 members published several journal articles advancing the science and technology of hazardous waste vitrification.

Plans for 2023: A special issue on "Hazardous Waste Vitrification" is being planned in the journal Materials Letters. TC05 will organize the "3rd Summer School on Nuclear and Industrial Glasses for Energy Transition," from September 25-29, 2023, at Nimes, France. 3rd Workshop Symposium on VITROGEOWASTES will be organized in Bulgaria (together with the traditional Balkan Conference on Glass) in 2023. Dr. Alexander Karamanov will be the organizer of the event.

The technical committees – TC03 (Structure and Properties), TC05 (Hazardous Waste Vitrification) and TC07 (Nucleation, crystallization, and glass-ceramics), TC18 (Glass melting technology) – are planning to organize a summer school/conference on the theme of *glass and sustainability* during 2024.

TC06: Mechanical & Nanomechanical Properties, Characterisation

TC06 organized a symposium on glass mechanics at the ICG congress in Berlin.

A perspective paper was published in Advanced Materials led by the TC's chair and co-chair, <https://doi.org/10.1002/adma.202109029>.

Round robin test preparations on glass hardness was re-started; experimental conditions at the involved labs were screened and a consistent experimental plan was developed; thermally strengthened glasses will be included into the round robin.

TC07: Crystallisation & GCs, Basics

J. Deubener organized the ICG2022 Congress in Berlin as Congress President. TC07 held a session P2 Crystallization and Glass-Ceramics of Symposium III Glass Physics, Properties and Characterization.

TC09: Energy Efficiency, Glass Production

TC10: Optical Properties and Characterization, Application

Ingrid Marenne completed her term of 9 years as chair. James Farmer is the new Chair. TC10 held two meetings in 2022, focusing on the preparation of three interlaboratory comparisons

for measurement of emissivity, and revision of various European and North American standards.

Emissivity Interlaboratory Comparisons: A sub-group of TC10 has developed three proposals for measurement of emissivity:

- 1) Round Robin for heat treated glass – the final optical properties of a thermally toughenable coating are achieved by the tempering process; this however leads to a non-flat test specimen which is difficult to characterize using traditional methods. The round robin will focus on measurement of non-flat samples using FT-IR spectrometers with direct reflection units and integrating spheres, alongside the use of emissimeters and sheet resistance measurements. Low emissivity as-deposited/heat treated samples have been prepared and initial characterization measurements performed.
- 2) Evaluation emissivity measurements - The objective is to allow labs to evaluate the quality of their emissivity measurements, separating the contributions to the uncertainty in the calibration standard from that of the measurement device and sample. Gold reference mirrors have been sourced and characterized.
- 3) Round Robin according to EN 674 - The parallel planned round robin tests for emissivity measurements offer the possibility to validate Ug measurements according to EN 674 (Guarded hot plate method) via emissivity measurements according to EN 12898 and U value calculations according to EN 673. A validation of the measurement for inclined and horizontally oriented insulating glass panes as well as the measurements with a downward heat flow can also be carried out.

Optical Standard Development: TC10 members have made significant contribution to the prEN 410:2023 revision (Determination of luminous and solar characteristics of glazing), proposing two new annexes relating to a 'Modified Matrix Method for non-scattering Incoherent Optical Systems', and 'Modifications to the formulae to permit calculation and declaration of the luminous and solar properties of BIPV glazing'.

A section of prEN 17940:2023 (Folio Interlayers for the Manufacturing of Laminated Glass) relating to the derivation of interlayer properties from a laminated glazing was proposed/discussed by TC10 members and accepted within the revision.

Plans for 2023: Distribution of samples and measurement instructions to participants for all 3 round robins is expected in early 2023.

TC11: Materials for Furnaces, Glass Production

TC12: Pharma Packaging, Application

Plan to conduct an experimental activity on the effect of the depyrogeneration treatment of vials. Under certain industrial circumstances, vials can remain in the depyrogeneration phase for more than 50 hours, and nothing is known about the effect of this prolonged and unwanted treatment. TC12 decided to expand and diversify the experiments with the aim to investigate the phenomenon by including longer periods of depyrogeneration, the comparison of more vials, a comparison between labs, and the use of a different protocol for evaluating the delamination propensity.

During the year, the experimental protocol was defined, the vials to be tested were decided, and they were collected at the SG lab. At the end of the year four type of vials, 75 vials for each type, were shipped to the eight labs which will perform the experimental activity.

Plans for 2023: completion of the round robin study

TC13: Environment, Glass Production

TC14: Gases in Glass, Glass Production

TC16: Nanostructured glass and coating by wet chemistry

TC16 organized the workshop: "Photonic glasses by sol-gel" for IYOG 2022 as satellite event of the Sol-gel 2022 conference in Lyon in July 2022.

IYOG2022: A. Martucci presented at "Le mille vite del vetro" in Venice. Duran, Alicia; Castro, Yolanda, and Jitianu, Andrei participated to the The International Year of Glass 2022, Debriefing, United Nation, New York, 13-14th December 2022. Castro, Yolanda and Jitianu, Andrei were invited editors for a Special issue of the Journal sol-Gel Science and Technology dedicated to International Year of Glass 2022

Plans for 2023: S. Ribeiro will organize the "XII International School and Workshop NanoAndes 2023" in Araraquara-SP, Brazil.

TC17: Archaeometry of glass

IYOG2022: Chair Stephen Koob volunteered his time and conservation expertise at the Archaeological Museum of the American University of Beirut, Lebanon. The Museum suffered damage to their archaeological glass collection during the Port of Beirut explosion in 2021. Stephen spent 10 days assisting with the reconstruction of broken glass objects, as well as contributing to a 2-day International Symposium at the University, titled "Through Shattered Glass". <https://youtu.be/PmSLJ0qez5Q>

TC 17 members attended the International Symposium, "Glass degradation", held at the Rijksmuseum in Amsterdam, The Netherlands, in June. This was an excellent opportunity for the TC members to meet and discuss future ideas, projects and meetings.

Awards: Stephen Koob received the 2022 Robert L. Feller Lifetime Achievement Award for his exceptional contributions to the conservation profession

TC18: Glass Melting, Glass Production

Organised a workshop focused on Kinetics of batch to glass conversion the International Congress on Glass in Berlin.

TC19: Surface Properties, Application

Plan to find the new chair person who can lead the TC-19 in the post-COVID era. The current chair cannot lead the TC due to his administrative role at his institution. Assisted organization of the ACerS GOMD Symposium S2: Glass and Interactions with Its Environments: Fundamentals and Applications.

TC20: Photonic glasses and optical fibers, Application

IYOG2022: Kathleen Richardson organised the National Day of Glass Washington D.C.. Younès Messaddeq is organizing a conference for 45 French speaking countries and regions.

Giancarlo Righini, Ciro Falcony, Maurizio Ferrari and Shilin Jiang organised the 9th International Workshop on Photoluminescence in Rare Earths: Photonic Materials and Devices.

TC21: Furnace Design & Operation

TC23: Education

TC26: Structure & Vibrations, Basics

Change of Chair: Nadege Ollier took over from Bernhard Hehlen, and together they refounded the TC, redefining its main topics and by inviting new members. The new member's list has been submitted and accepted by the CTC.

Bernard Hehlen contributed a chapter to the ICG IYOG2022 book : "A century of structural and vibrational spectroscopy in vitreous silica: A short review".

TC27: Atomic Simulation

TC27 was selected as the best TC website award by ICG CTC and held a TC dinner during ICG Congress in Berlin.

TC members organized sessions and presented invited talks at Modeling and simulation sessions at ICG Congress Berlin and other conferences.

TC chair and members published two new books on atomistic simulations of glasses in 2022. They also contributed several book chapters on related topics.

Plans for 2023: International Workshop on Molecular Dynamics Simulations of Glasses.

TC28: Glass fibres for reinforcement

TC29: Quantum Beam Diffraction, Basics

3. Annual meetings

The annual meeting was held in Berlin in July.

4. Turner Award

The Turner Award 2022 was given to Delia Brauer and Hande Sesigür

Delia Brauer

Delia Brauer is Professor of Bioactive Glasses at the University of Jena, Germany, best known for her work on bioactive glasses and phosphate glasses. She has been a member of TC04 (Bioglasses) since 2012 and a member of TC23 (Education) since 2018. Her service to TC04, TC23 and the ICG goes way beyond the norm.

She was Chair of TC04 from 2018- 2022. As Chair, she organised an exchange project (funded by CTC) of PhD students and early-career postdocs between different TC04 member groups, which allowed early career bioactive glass researchers to perform a research project in a different laboratory. She started a TC04-wide round robin study on establishing a standard cell test for bioactivity through a CTC awarded grant (2021), in collaboration with ASTM.

She has just edited a book on Phosphate and Borate Bioactive Glasses, to which several TC04 members contributed and she has initiated several TC04 review papers. She co-wrote the chapter on Bioglasses for the ICG book on the International Year of Glass (IYOG) and another on Bioactive Glasses for the Encyclopedia of Glass Science, Technology, History, and Culture.

Delia was a founding editorial board member of the Biomedical Glasses journal (published by De Gruyter), and in 2019, together with other TC04 members, she organised a special issue in this journal, celebrating 50 years of bioactive glasses. Delia has organised and co-chaired several TC04-led symposia at ICG and GOMD conferences, and in 2020 was (together with J. Rimsza) conference programme chair of the ACerS GOMD conference and its replacement online-meeting, the Virtual Glass Summit, which was the first all-online conference of GOMD.

Delia also taught in the 2018 ICG Summer School in Montpellier, as part of that year's focus on bioactive glasses as well as in the 2017 PhD School in Kolkata, India. Her contributions to TC activities and her international standing in the field make her a worthy recipient of the 2022 Turner Award.

Hande Sesigür

Hande Sesigür has taken on many roles within ICG since becoming a member of TC18 (Glass Melt Properties) on behalf of Şişecam in 2000. She joined Coordinating Technical Committee in 2011 and became the chair of the "Glass Production Cluster" in 2012. During her membership she prepared an expert meeting of the Glass Production Cluster with the previous chair Prof. Ruud Beerkens in 2012. She was the member of Organizing Committee of ICG 1996 Annual Meeting which was held in Istanbul, and was the project leader of the ICG 2017 Annual Meeting also held in Istanbul. She also contributed to the 2nd edition of the "ICG Road Maps of Glass R&D with a 25 year horizon" book. In addition Hande Sesigür has contributed to the ICG2030 project. Beyond ICG she is the member of the Glass Trend Advisory Board on behalf of Şişecam. For her overall contributions to ICG TCs and CTC Hande Sesigür is a worthy recipient of the 2022 Turner Award.

5 The Best TC Websites

TC27 was selected as the best TC website award by ICG CTC and held a TC dinner during ICG Congress in Berlin.

6 ICG fund for 2022

CTC offered financial support up to maximum 4000 Euro to each TC for 2022.

Results of the amount of the support of fund for 2022

Technical Committee	Decision
TC16 IYOG workshop on Photonic glasses by sol-gel	€3000
TC20 IYOG webinar support	€4500

7. Clusters and TC Chairs

Below is a list of TCs and their chairs that belong to each cluster. The CTC requested that the TC Chair submit an annual report of 2022 to the coordinators of each cluster.

Commented [U1]: Russell

Cluster	Cluster Chair	TC number & name	TC Chair
Basics	Bernard Hehlen	TC03: Glass Structure	Daniel Neuville
		TC07: Crystallisation & GCs	Laurent Cormier
		TC26: Structure & Vibrations	Nadege Ollier
		TC27: Atomistic Simulation	Jincheng Du
		TC29 :Quantum Beam Diffraction	Shinji Kohara
Characterisation	Kiyoharu Tadanaga	TC02: Durability & Analysis	Peggy Georges
		TC06: Mechanical & Nanomechanical Properties	Lothar Wondraczek
		TC10: Optical Properties	James Farmer
		TC19: Surface Properties	Seong H. Kim
Application	Yuanzheng Yue	TC04: Bioglasses	Jonathan Massera
		TC05: Waste Vitrification	Ashutosh Goel
		TC12: Pharma Packaging	Massimo Guglielmi
		TC16: Nanostructured glass and coating by wet chemistry	Alex Martucci
		TC20: Photonic glasses and optical fibers	Shibin Jiang
		TC28: Glass fibres for reinforcement and insulation	Yuanzheng Yue
Glass Production	Tolga Uysal	TC09: Energy Efficiency for Glass Production	Hans Van Limpt
		TC11: Materials for Furnaces	Jean-Pierre Meynclens
		TC13: Environment	Walter Battaglia
		TC14: Gases in Glass	Stefano Ceola
		TC18: Glass Melting	Jaroslav Klouzek
		TC21: Furnace Design & Operation	Aaron Huber
Communications, Education, History	Ana Candida Rodrigues	TC01. Communications	Ana Candida Rodrigues
		TC17: Achaometry	Stephen Koob
		TC23: Education	Ana Candida Rodrigues
		Youth Outreach Committee	Mathieu Hubert

In 2022, due to the major renovation of the ICG home page, it was not possible to submit the annual report of each TC directly to the home page, and decided to send it to each cluster coordinator and the secretary of CTC. We hope that by submitting the report directly to the ICG website again in the near future, it will be more accessible and more timely available to more people.

8. Plans for 2023: improve website reporting