



**International Workshop and Symposium on the Synthesis
and Characterization of Glass/Glass-Ceramics
IWSSCGGC-2010**

WORKSHOP

July 7-8, 2010

Venue: C-MET Conference Hall

PROGRAMME & LECTURE NOTES

Organized By

*Centre for Materials for Electronics Technology (C-MET),
Department of Information & Technology, Govt. Of India,
Panchawati, off Pashan Road, Pune*

In association with

*Materials Research Society of India- Pune, Mumbai,
Gujarat and Kolkata chapters*

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PREFACE

Glass and glass-ceramics have become the backbone of modern technology even though the science of glass coating dates back to 12,000 B.C. Apart from their traditional uses; they play a pivotal role in various applications like optical communication, as laser host, innovative architecture, matrices for radioactive waste, immobilization, encapsulation/sealing, energy conservation, bio-medical applications, safety gadgets, automobiles, space and marine technology to name a few. Various applications of glasses stem by virtue of their physical and chemical properties such as transparency, chemical inertness, thermal stability, corrosion resistance, electrical insulation, long term durability, biocompatibility/ activity etc. Glass-ceramics form a new class of materials having enhanced properties as compared to glass alone.

In this context, R&D work has started with major emphasis in the three major sectors namely national security or strategic, industrial development (primarily small & medium scale industries) and societal activities covering some of the well defined problems of national importance such as energy, water, health care, communication and instrumentation. Ceramic materials for liquid and gas separation technology, nano-ceramics, photonic glasses for communications, high power microwave tubes etc. Optical glass is a strategic material used as lenses and prisms for making periscopes, binoculars, range-finders, gun-sights, fire directors, and scientific, photographic and survey instruments like microscopes, telescopes, cameras, projectors, theodolites etc. Besides the development of optical glasses, the work on introduction of modern techniques in glass and ceramic, basic studies on generation of colour in glasses, evaluations of different minerals of the country such as clay and mica for their suitability in specific uses, development of high temperature combustion boats are some of the important activities. The development of laser glasses, infra-red transmitting filters, synthetic quartz single crystal, high temperature protective enamels, high alumina ceramic seals and spacers etc has also been receiving profound attention across the globe. To this list, research work on foam glass, glass bonded mica, steel plant refractories can be added by keeping in mind the need of Indian industries in particular. Work in the field of optical fibre for telecommunications, sol-gel processing of glass and ceramic materials, production of glass fibre based composites and application of ceramic materials in electronics is also being persuaded in the country.

This International Workshop and Symposium on the Synthesis and Characterization of Glass / Glass-Ceramics is being organized by Centre for Materials for Electronics Technology (C-MET, Pune) in association with Materials Research Society (MRSI)-Pune, Mumbai, Kolkata and Gujarat Chapters during July 7-10, 2010. Workshop will be held during July 7-8, 2010. Materials Research Society of India - Mumbai Chapter had previously organized a Workshop on glass-to-metal and Ceramic-to-metal seals. The present Workshop is aimed at providing scientific information and data essential for synthesis as well as characterization of glass along with ceramics and glass-ceramics. For this Workshop, we have received overwhelming response with about 50 participants. This two-day Workshop will cover 1 plenary lecture, 11 invited lectures by eminent scientists from India and abroad. We have planned a visit to glass & characterization laboratory in C-MET, and a factory visit.

This compilation contains the lectures of the speakers. They cover a range of relevant topics from the basics to the preparation/synthesis of glass, glass-ceramics, glass-composites, glass-nanocomposites and the associated safety issues. Readers may find some inevitable overlap in the matter presented in various talks.

The Organizing Committee feels indebted to all the speakers and sponsors for their timely and unflinching support.

Dr. D.P. Amalnerkar
Chairman

Dr. G. P. Kothiyal
Co-Chairman

Dr. B. B. Kale
Convener

7th and 8th July, 2010

IWSSCGGC-2010

Materials Research Society of India (MRSI)

Materials Research Society of India (MRSI) is an interdisciplinary professional body dedicated for the growth of indigenous research and development in the area of materials science and engineering and their applications. MRSI is a founding member of Asia Pacific Academy of Materials (APAM) and is also founding adhering Body of the International Union of Materials Research Societies (IUMRS)

Centre for Materials for Electronics Technology (C-MET), Pune *(Young Organization with Ignited Minds)*

C-MET- A pioneering Institution

Centre for Materials for Electronics Technology (C-MET) was set up as a Registered Scientific Society under department of Information and Technology (formerly Department of Electronics) in March 1990, as unique concept for development of viable technologies in the area of materials mainly for electronics. C-MET is operating with its laboratories with specializations at Pune, Hyderabad and Thrissur. Besides augmenting core competence, C-MET envisions attainment of self-sufficiency in the sphere of Electronic materials, components and devices to cater to India's strategic- and industrial- applications, exploiting indigenous resources of raw materials. R&D activities in C-MET at present include development of thick film materials, polymers for electronics, specialty chemicals and glasses, ultra high purity and refractory metals, semiconductors, electronic ceramics and fine powder processing. C-MET undertakes joint R&D, sponsored research, technology transfer and consultancy projects and provides technical services.

The Formative years

During its formative years, the Directors and the diligent young scientists helped to build a state-of-art infrastructure for material research. In nineties C-MET had established infrastructure facilities like air-conditioned building and world class state-of-art characterization facilities with industry and academia in mind. In the mid nineties, C-MET established its credential as a world class research and development institution in the area of material science. World class packaging facility, Material synthesis and processing facilities have been created. The work has been recognized by industry, strategic sectors like Space and Defense. Since 2000-05, C-MET has created a brand name for itself with many projects and new state- of-art facilities like FE-SEM, AFM etc. C-MET has established tie-up with space, defense and BARC by innovating custom designed materials for them.

Keeping space with change – Breaking new grounds

Over the last few years, C-MET has increasingly focused on applying chemical and physical sciences to some of the significant challenges of our times, namely clean energy, Packaging (micro), nanotechnology, Nanomaterials synthesis, new materials for our space mission. C-MET has done excellent work for space materials and has been recognized by ISRO. C-MET has accepted the change and excellent work in Nano-science and Nanotechnology towards innovative application was under taken. Work on Nanomaterials, Glass nanocomposites and polymer nanocomposites have been undertaken. C-MET has also focused their R.D on specialty polymers, metals, alloys, advanced nano-ceramics and optical glasses. C-MET is publishing 50-60 papers in international reputed journals and 10

patents every year. *Today, C-MET is recognized as reputed material science and knowledge based R & D and consulting organization. C-MET is also a unique material research laboratory of India.*

International Workshop on the Synthesis & Characterization of Glass/Glass Ceramics (IWSSCGGC)-2010

Venue: C-MET, Pune

7th and 8th July 2010

TECHNICAL PROGRAMME FOR WORKSHOP

6th July, 2010		
1700-1900 hr	REGISTRATION	C-MET , Pune
7th July, 2010		
0800-0900 hr	REGISTRATION	C-MET
0900-1030 hr	<p>Inaugural Function <i>Lighting of the Lamp and Sarsawati Vandana</i></p> <p>Welcome : <i>Dr. D.P. Amalnerkar, Chairman, IWSSCGGC-2010</i></p> <p>About the Workshop: <i>Dr. G.P. Kothiyal, Co-Chairman, IWSSCGGC-2010</i></p> <p>Address by Chief Guest <i>Shri Anil Datar, Director ARDE, Pune</i></p> <p>Guest of Honour <i>Adv. Shri. Raosaheb Shinde,</i> <i>(Freedom-fighter & Social Worker)</i> <i>Chairman , Rayat Shikshan Sanstha , Maharashtra</i></p> <p>Plenary Lecture <i>Prof. Animesh Jha, UK</i></p> <p>Vote of Thanks <i>Dr. B.B. Kale, Convenor, IWSSCGGC-2010</i></p>	C-MET Conference Hall

1030-1100 hr	TEA BREAK	
1100-1315 hr	Lecture Session-I Session Chair: Dr. B. D. Kulkarni, NCL	C-MET Conference Hall
1100-1145 hr	Prof. A. R. Kulkarni , IIT, Mumbai <i>"Glasses and Glass Ceramics -- fundaes"</i>	
1145-1230 hr	Dr. V. Sudarsan, BARC, Mumbai <i>"Characterization of Glasses and Glass-Ceramics"</i>	
1230-1315 hr	Prof. Alicia Duran, SPAIN <i>"RE doped oxy-fluoride nano-glass-ceramics containing LaF₃"</i>	
1315-1400 hr	LUNCH	
1400-1530 hr	Lecture Session- II Session Chair: Prof. Alicia Duran	C-MET Conference Hall
1400-1445 hr	Dr. Ashok Joshi, USA <i>Ionic Ceramics</i>	
1445-1530 hr	Dr. C.L. Nagendra, ISRO <i>"High Performance Glass and Ceramics Materials for Optical Applications in Space"</i>	
1530-1545 hr	HIGH TEA	
1545-1800 hr	Lab Visit (Demonstrations)	
1930 hr	DINNER	
8th July,2010		
0900-1115 hr	Lecture Session-III Session Chair: Prof. A. R. Kulkarni	C-MET Conference Hall
0900-0945 hr	Prof. Himanshu Jain, USA <i>"Sensitivity of Glass to Processing Conditions: Good or Bad?"</i>	
0945-1030 hr	Dr. Satish Mahajan, USA <i>"A Magneto-Optic Effect in Glasses "</i>	
1030-1115 hr	Dr. R. N. Basu, CGCRI, Kolkata	

	<i>“Application of Glass-based Sealants for Solid Oxide Fuel Cell Stack Fabrication”</i>	
1115-1130 hr	TEA BREAK	
1130-1330 hr	Lecture Session-IV Session Chair: Dr. Salish Mahajan	C-MET Conference Hall
1130-1215 hr	Dr. Francois Mear, FRANCE <i>“Autonomic Healing for SOFC Sealing Glass”</i>	
1215-1300 hr	Dr. P. A Joy, NCL, Pune <i>“Characterization of ceramic materials using powder X-ray diffraction”</i>	
1300-1330 hr	Dr. S. D Bharambe, BARC, Mumbai <i>“Safety Issues Related To Glass/Glass-Ceramics Preparations</i>	
1330-1415 hr	LUNCH	
1430-1900 hr	GLASS FACTORY VISIT	
1930 hr	DINNER	

Plenary Lecture

- PL-1. A Jha
***MID-IR Optical Fibres and Waveguides and their Applications
In Devices***

Invited Lectures

- IT-1. A. R. Kulkarni
Glasses and Glass Ceramics -- fundaes
- IT-2. V. Sudarsan
Characterization of Glasses and Glass-Ceramics
- IT-3. A.Durán
RE doped oxy-fluoride nano-glass-ceramics containing LaF₃
- IT-4. Ashok Joshi
Ionic Ceramics
- IT-5. C.L.Nagendra
***High Performance Glass and Ceramics Materials for
Optical Applications in Space***
- IT-6. Himanshu Jain
Sensitivity of Glass to Processing Conditions: Good or Bad?
- IT-7. Satish Mahajan
A Magneto-Optic Effect in Glasses
- IT-8. Rajendra N. Basu
***Application of Glass-based Sealants for Solid Oxide
Fuel Cell Stack Fabrication***
- IT-9. ***François O. Mear***
Autonomic Healing for SOFC Sealing Glass
- IT-10. P.A.Joy
X-Ray Diffraction
- IT-11. S.D. Bharambe
Safety Issues Related To Glass/Glass-Ceramics Preparations
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