



ANNUAL REPORT 2010-11

Centre for Materials for Electronics Technology (C-MET)

(A Scientific Society, under Department of
Information Technology, Ministry of Communications
and Information Technology, Government of India)



RoHS Facilities



Governing Council of C-MET (2010-2011)

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ANNUAL REPORT 2010 - 2011



CENTRE FOR MATERIALS FOR ELECTRONICS TECHNOLOGY (C-MET)

**(A Scientific Society, under Department of Information Technology,
Ministry of Communications and Information Technology,
Government of India)**

CONTENTS

	<u>Page No.</u>
● Preface	4
● Introduction	5
● The Vision	5
● The Mission	5
● Importance of R & D in Electronic Materials & Significance of C-MET	5
● Our Approach	6
● Current Astrategy	6
● C-MET Laboratories and Core Competence	7
● C-MET Organization Structure	8
● Human Resource Indicators	9
● Technical Activities and Progress During 2010-11	10
i) Pune Laboratory	15
ii) Hyderabad Laboratory	19
iii) Thrissur Laboratory	21
● Important Events at C-MET	24
- Annual Foundation Day & RRCA	24
- Inauguration of Microwave Materials Processing Laboratory	25
- Organization of International Conferences/Workshop etc.	26
- Signing of MoUs	28
- Distinguished Visitors	30
● Publications	33
i) In Peer - reviewed Journals	33
ii) In International / National conferences / Symposia	34
iii) Patents Applied	39
iv) Invited Lectures by C-MET Scientists	40
v) Awards and Honours	41
● Plans and Prospects	42
● Acknowledgement	43
● Major Characterization Equipments Available at C-MET	44
i) Pune	44
ii) Hyderabad	45
iii) Thrissur	46
● Auditor's Report and Annual Accounts	47

PREFACE

It gives me utmost pleasure to present the Annual Report of C-MET for the year 2010-2011. This report is an account of a successful year which furnishes abridged information on the activities, accomplishments, output and overall impact of C-MET during this period.

The research and development activities at C-MET span a wide range of fields relevant for electronics, energy and allied technologies which are in-line with the vision and mission of C-MET. Enhanced abilities to understand and manipulate the matter at the nano-scale promise a new wave of momentous technologies in the spheres of electronics and IT over the next five decades. Consequently, we have aligned our core competence in tune with design and development of electronic materials relevant to the nano-science and technology.

This year, 16 sponsored projects were completed and 8 new externally funded projects have been initiated. It is quite gratifying to state that our budgetary resources from extramural sources have reached to the tune of ₹ 1574.52 lakhs during this year.

Let me summarize some of the foremost accomplishments pertaining to this year. C-MET has signed two cross-border MOUs with industries viz. E-Parisaraa, and Moserbaer India Ltd., for collaboration in the vital areas like e-waste and photovoltaic energy conversion, respectively.

During the year, scaling up to higher standards of scientific achievements is evident from research performance indicators of C-MET (in terms of 27 research papers in peer-reviewed international journals, 52 contributory paper presentations at various national / international conferences, 14 Indian patent applications, 3 Ph.Ds and 24 invited talks). This year scientists and students from C-MET have shown their research excellence in terms of five Best Presentation awards in the conferences /symposia and an Emerald Literati Network-Highly Commended Award - 2010 for a contributory paper.

C-MET, Pune has effectively organized International Workshop and Symposium on Synthesis and Characterization of Glass /Glass Ceramics (IWSSCGGC-2010) during 7-10 July, 2010 in collaboration with Materials Research Society of India (MRSI) Pune, Mumbai, Kolkata and Gujarat Chapters. C-MET has also played a cornerstone role in organizing International Conference on NANO Technology Materials & Composites for Frontier Applications (NANOCON-2010) during 14-15 October, 2010 in collaboration with Bharati Vidyapeeth University, Pune, North Carolina A & T



State University, USA and Tuskegee University, USA. Besides, C-MET was instrumental in organizing International Symposium on Materials Education (ISME-2011) during 26-28 March, 2011 in collaboration with Indian Institute of Science Education and Research (IISER), Pune, National Chemical Laboratory (NCL), Pune and Defence Institute of Advanced Technology (DIAT), Pune.

As a part of its Annual Foundation Day celebration, C-MET has organized National Conference on “RoHS Regulations and Chemical Analysis for Compliance (RRCA-2011) during March 8-9, 2011 at, Hyderabad to promote the awareness on Restriction of Hazardous Substances (RoHS) for export of electronic and related goods to European Union. The presidential address was delivered by Shri R. N. Jayaraj, Chief Executive, NFC, Hyderabad. Dr S. P. Vasireddy, CMD, Vimta Labs, Hyderabad graced the inaugural function as the Chief Guest. Dr. Lakshmi Raghupathy, Advisor, GIZ-MAIT, New Delhi has enlightened the audience via the key note lecture. Around 250 participants including delegates from industries, researchers, students, academicians from reputed institutions and universities have attended this conference. As far as possible, C-MET intends to follow this trend of organizing a conference on its Foundation Day every year to deliberate on different topics of scientific/technological significance.

On the whole, like previous years, C-MET maintains to march ahead with the blending of materials development efforts for strategic sector and the new service-rendering initiatives like RoHS and e-waste treatment.

I must accentuate that the presentations in this Annual Report reflect the stimulating atmosphere that is induced by motivated co-workers and exciting projects.

It is my sanguine belief that C-MET will steadily attain illustrious position in R&D of advanced electronic materials and cutting edge process-technologies in the global perspective.

Dr. D. P. Amalnerkar
Executive Director

INTRODUCTION

Centre for Materials for Electronics Technology (C-MET) has been set up as a Registered Scientific Society in March 1990 under Department of Information Technology (formerly Department of Electronics) as a unique concept for development of viable technologies in the area of materials mainly for electronics. C-MET is operating with 3 laboratories located at Pune, Hyderabad and Thrissur with specialized research mandate at each place.

OBJECTIVES

The objectives of C-MET are :

- To establish the technology up to pilot scale for a range of electronic materials and transfer the same to industry for commercialization.
- To establish relevant characterization facilities.
- To undertake applied research activities in the area of its operation.
- To establish national data base on electronic materials.

C-MET has set up its vision, mission and strategy to achieve its objectives.

THE VISION

C-MET will become a premier R&D organization known all over the world for its knowledge base, innovations and expertise in Electronic Materials.

THE MISSION

To develop knowledge base in electronic materials and their processing technology for Indian industries and to become a source of critical electronic materials, know-how and technical services for the industry and other sectors of economy

IMPORTANCE OF R&D IN ELECTRONIC MATERIALS & SIGNIFICANCE OF C-MET

Electronic materials form an important segment of Advanced Materials. The materials technology is highly guarded by the major players considering their critical nature. Today, Information Technology (IT) is one of the premier global technologies. IT comprises data (or information) generation, categorization, transmission, retrieval, processing, and propagation to the benefit of society. Microelectronics is the keystone of information technology. A strong IT network needs supporting systems and sub-systems, which have the roots in the advanced electronic materials. Although electronic materials are primarily associated with computers, the internet and mobile technologies; they are used in many applications which help to improve overall quality of life. Electronic materials form an extremely complex subject area. The progress made in traditional scientific fields often depends upon new developments in electronic materials. Advanced electronic materials (viz. nano-scale electronic materials for miniaturized subsystems and systems and nano-spintronics by considering, in particular, nano-architecture and scalability issues) have been identified as one of the critical technology areas by both developed and developing nations. Electronic materials are crucial to the total development of a nation irrespective of the preference be given to defence, agriculture, education, medicine, space or any other field. New heterostructure device concepts will be the basis for further improvements in micro and optoelectronics. High-K (permittivity materials) play an important role in down-scaling metal oxide semiconductor field effect transistors and dynamic random access

memories. Non-volatile memories currently represent large proportion of the semiconductor market and are one of the most important technologies for mobile applications, the main end product being the flash memory. If the present trend is an indication, advancement in electronic materials technology may become the base of the total technology strength of a nation in future.

Research and development activities in the electronic materials domain have been pursued in various institutions in the country. **However, a clear focus to undertake client relevant R&D activities lies only with C-MET. This uniqueness of C-MET is imparted through its objectives laid down during its establishment.** All the developmental programs undertaken and carried out during 8th, 9th and 10th Plan are in accordance with these objectives. Various process and product technologies were developed in the area of electronic materials through all these years but a major stumbling block that came was the after effects of globalization and open market scenario immediately after the formation of C-MET. Understanding this scenario, new knowledge based methodologies have been evolved to increase the partnership of end users like industries and strategic sectors in C-MET's technical program.

OUR APPROACH

- Majority of Indian Electronic Materials Industries do not have well defined in-house R&D facilities and are not in a position to set up new production line for new technologies through scale-up. At the same time, after the globalization, it has become imperative for them to improve their production with respect to quality, quantity and delivery time to compete with the foreign counterparts. To achieve this, they have to depend on either foreign collaborators or identify a suitable Indian partner, which is capable of delivering the results. Industry had faced problems with absorption and up-gradation of imported technologies, to keep up with the latest trends in product quality and hence, it has become essential for them to improve it with the help of agency like C-MET, which is having a strong knowledge base. C-MET has identified this, as a right opportunity to shake hand with the industry. For instance, **C-MET has initiated dialogues with prominent industries viz Moserbaer, India, Tata Chemicals, Sud Chemie etc.** A shift from the technology transfer to providing services to industry is required in the changed situation.
- Strategic sectors have been routinely facing uphill task to procure the materials or components for their operation from western countries. Indian industries are lacking in the cutting edge technologies. Identification of a right agency in both these cases is very important and C-MET has a very major role to play in terms of bridging the gaps. C-MET's expertise, infrastructure and years long experience suit to take up this challenging responsibility. Hence, the total system has been mobilized and geared up to utilize the present situation in favour of C-MET. **Accordingly, C-MET has signed major MoUs with DRDO, ISRO and DAE institutes.**

CURRENT STRATEGY

In order to accomplish the set objectives, we have adopted the following strategy for project execution at C-MET.

- To implement projects with outputs which are required by industry in immediate future (Say up to 5 to 7 years).
To carry out these activities, basic infrastructure, other facilities and necessary scientific expertise needs to be fully developed especially at pilot plant scale.
- To implement projects which are expected to generate technologies/results which would be commercialized in the period of 5 to 15 years and the products/processes which are required for critical areas covering space, atomic energy, defense etc. which are essentially small volume high value products.

In some cases, it may be necessary for C-MET to operate pilot plants or 'Technology Demonstration cum Market Sensitization (TDMS)' units for these products to meet small demand of critical sectors.

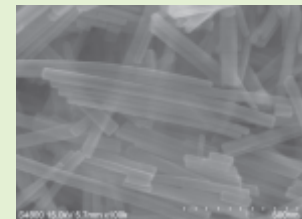
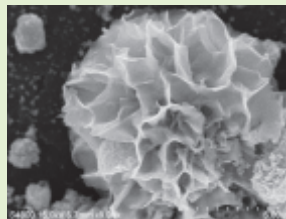
- To develop strong knowledge base
The technology development activities and pilot plant activities can not be sustained for longer period unless these are backed by internal scientific capability and expertise of required standard. This could be generated by various means e.g. by undertaking basic research in the concerned areas within the country and/or abroad, undertaking training and research by C-MET scientists as also, providing facilities to outside scientists in C-MET. This, in turn, will help in sustaining future activities of C-MET, as also, to achieve the objective of becoming the 'Centre of Excellence'. Moreover, development of strong knowledge base in specialized arena of electronics materials (Gen-next thick film paste for cell phones, energy conversion and storage materials etc) is also essential from the standpoint of Knowledge Process Outsourcing as a global phenomenon. Such activities are also necessary for providing job satisfaction and motivation to scientists.

C-MET'S LABORATORIES AND CORE COMPETENCE

C-MET's R & D activities have been implemented in three laboratories at Pune, Hyderabad and Thrissur. The laboratory at Pune functions as headquarters and extends central coordination support. Each of these laboratories has its own area of specialization with requisite infrastructure and expertise. This approach has proven to be successful in creating core competence at each laboratory.

- Pune Laboratory**

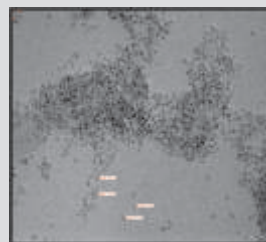
Materials for Electronic Packaging, Speciality Polymers, Nano-materials /composites



Hierarchical and planer nanostructures of CdIn₂S₄ and CdS

- Hyderabad Laboratory**

Ultra Pure Materials and Compound Semiconductors; Refractory Metals, alloys and Special Materials



FePt Nano particles



GaSb Crystalline Ingot

- Thrissur Laboratory**

Microwave dielectrics, Multilayer Ceramics, Actuators and Sensors, Nanomaterials and thin films, Aerogels



Bimorph based Mirror



Chip in glass Thermal sensor

C-MET ORGANIZATION STRUCTURE

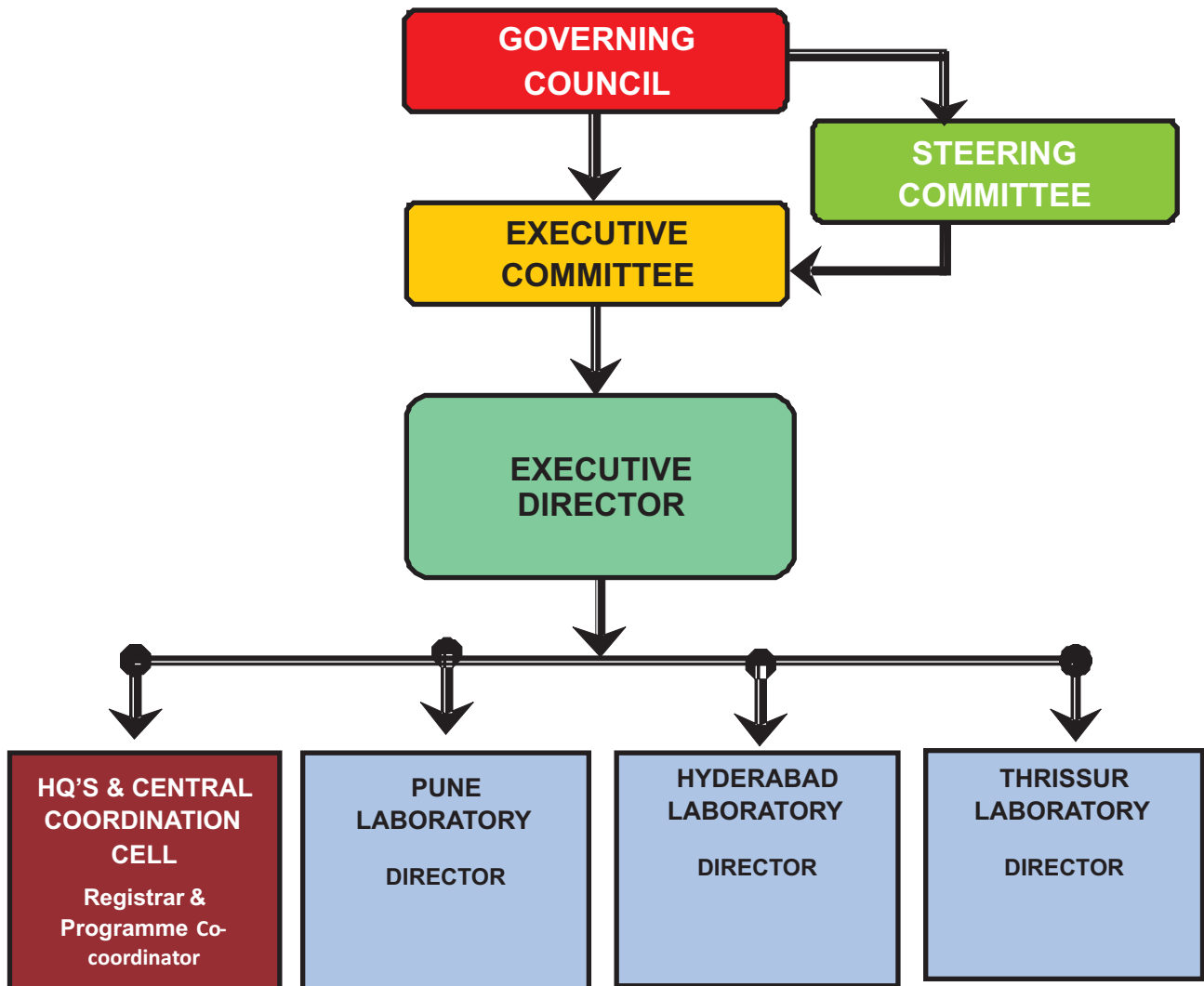


Figure 1 : Organization Chart of C-MET

HUMAN RESOURCE INDICATORS

C-MET team consists of 40 S&T officers, 25 S&T personnel and 36 administrative staff. Among S & T staff 33 personnel are having Ph. D degree. The average age of scientific staff is 43.8 years. This year, Dr. Mulla, Retired Scientist from NCL, joined C-MET as Emeritus Scientist (CSIR).

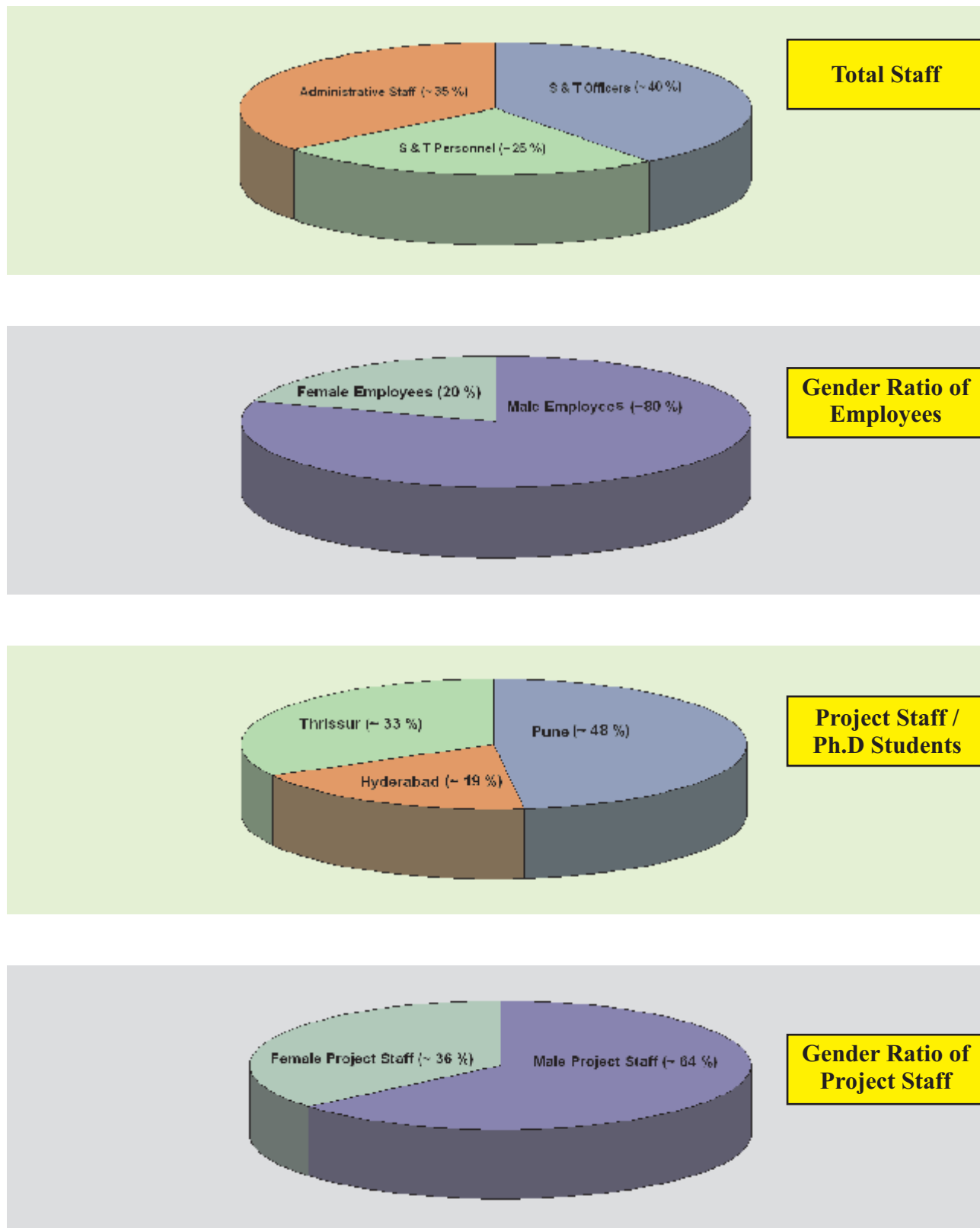


Figure 2 : Human Resource Indicators of C-MET

TECHNICAL ACTIVITIES & PROGRESS DURING 2010-11

During the year 2010-2011, the main technical activities of C-MET covered the following areas :

- Grant-in-Aid projects from DIT as well as various government funding agencies like DST, MNRE, ISRO, BARC, BRNS, NPMASS, DRDO etc.
- Technical services
- Materials characterization services

Core Program:

During the 11th Plan, it has been proposed to have a more coordinated and focused approach to the R & D area where C-MET can deliver by exploiting its long experience in the development of traditional and advanced electronic materials and expertise gained hitherto and through inter- laboratory research integration.

As per decision taken by the Governing Council of C-MET during 2007-08, the projects proposed in 11th Plan were thoroughly reviewed with respect to the approach and strategy and accordingly, it was proposed to implement five major programs as enlisted in the following table.

No.	Core Program	Selection Criteria	Broad Objectives
1	Integrated Electronics Packaging	<ul style="list-style-type: none"> • Strategic Requirement • Potential Hub for Electronics Packaging Solutions 	<ul style="list-style-type: none"> • Development of LTCC Materials of Integrated Passive Components • Development of LTCC Applications • Development of High Density Interconnects
2	Nanomaterials and Devices	<ul style="list-style-type: none"> • Advanced Research • Entrance in Cutting-edge Technology • Potential for Knowledge Process Outsourcing 	<ul style="list-style-type: none"> • Large-scale Generation of Nanopowders in a Transferred/Non-transferred Arc Plasma Reactor • Development of Quantum Dots of Semiconductors and Metals in Various Organic Matrices for Optoelectronics and Electronics • Development of Polymer Nanocomposites • Development of Nanomaterials for Photonics and Electronics • Nanoelectronics : Training and Certification

No.	Core Program	Selection Criteria	Broad Objectives
3	Ultra High Purity Materials	<ul style="list-style-type: none"> • Technology Transfer Possibilities • Probable Pilot Plant Facility under TDMS of UHP Metals to Meet Limited Demands of Strategic Sectors 	<ul style="list-style-type: none"> • Development of Process Technology for Refractory Metal Nanopowders • Pilot Plant Scale Production of UHP @ 2Kg per Batch for Opto-electronic Applications • Development of Process Technology for Single Crystals • Development of Other Compound Semiconductor Materials for MBE • Technology Transfer of Refractory Metals Production to Strategic Sector
4	Materials for Renewable Energy	<ul style="list-style-type: none"> • Energy Storage/ Conversion Oriented Applications • Potential for Knowledge Process Outsourcing 	<ul style="list-style-type: none"> • Development of Glass/Polymer Nanocomposites for Optoelectronics and Energy Applications • Development of Transparent Conducting Oxides for Electronics and Optoelectronics • Development of Nanoporous Materials (Aerogels) for Strategic and Industrial Applications • Development of Conducting Aerogels for Electronic Applications
5	Piezo Sensors and Actuators	<ul style="list-style-type: none"> • For Strategic and Allied Applications 	<ul style="list-style-type: none"> • Development of Nano Material based Thick Film Sensors • Development of Nanoceramics for Microactuator and Varactors.

All these programs are supplemented / complimented by Grant – in – Aid sponsored projects.

Externally Funded Projects

In addition to ongoing sponsored projects continued from the last year, C-MET has initiated 8 new grant-in-aid projects and technical services projects during the year.

C-MET had an external funding (IEBR) to the tune of ₹ 1574.52 lakhs during the year 2010-11. The unit wise sponsored project funding pattern is depicted in Figure 3.

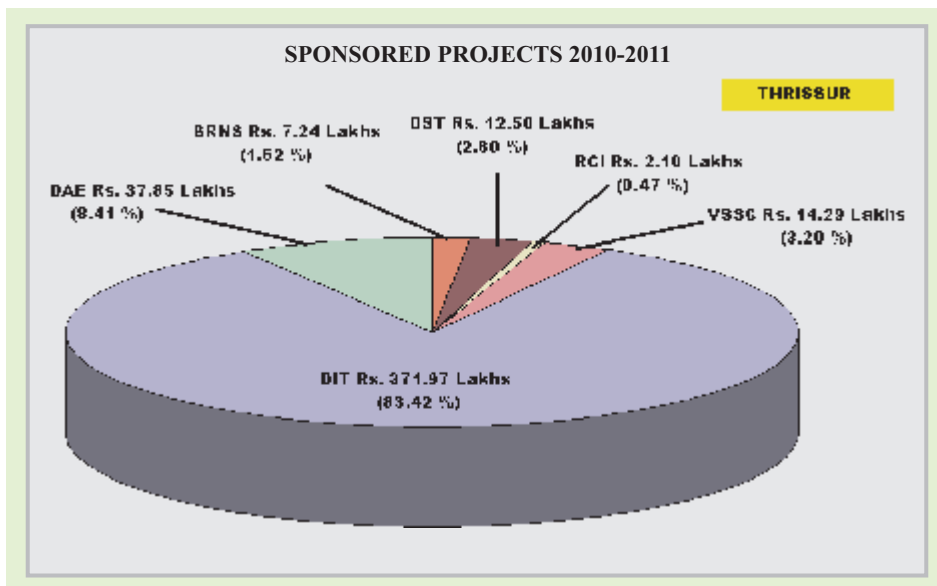
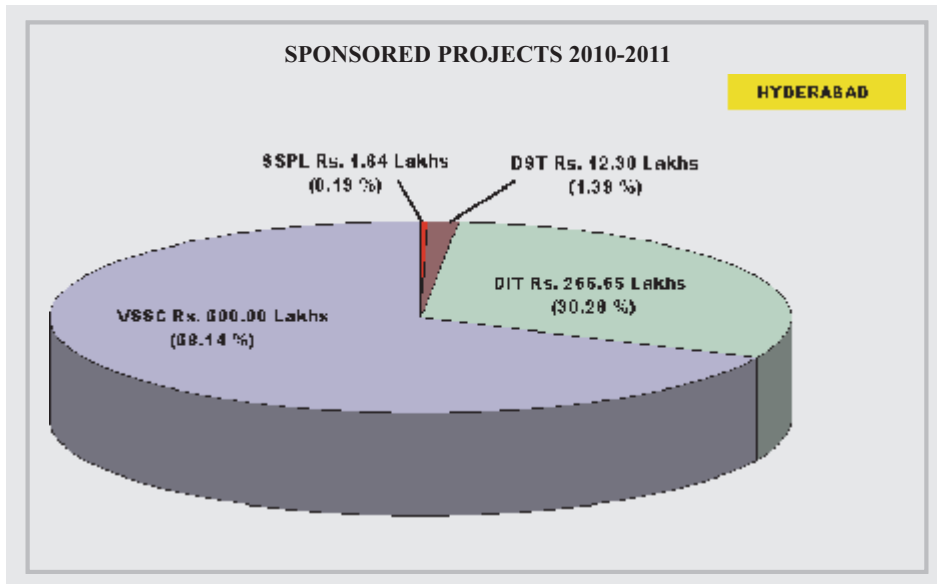
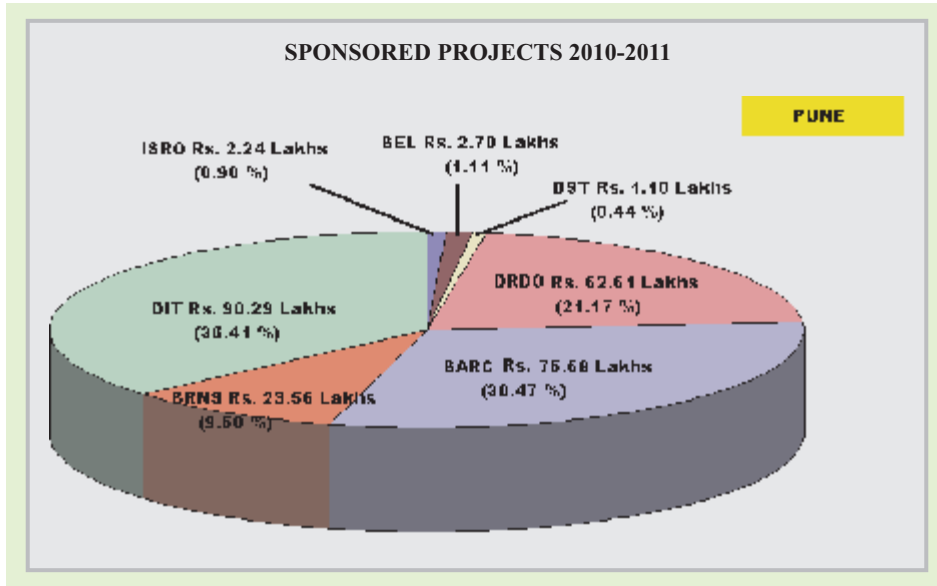
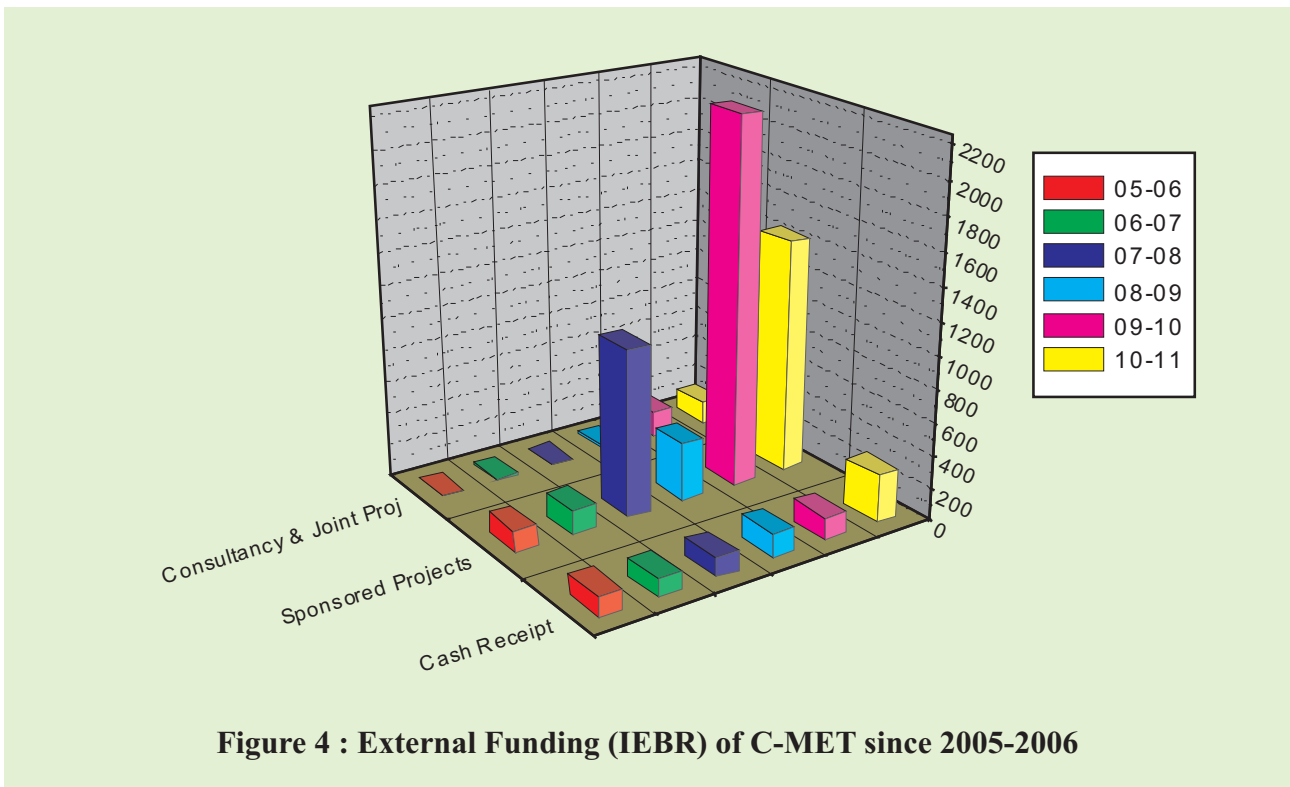
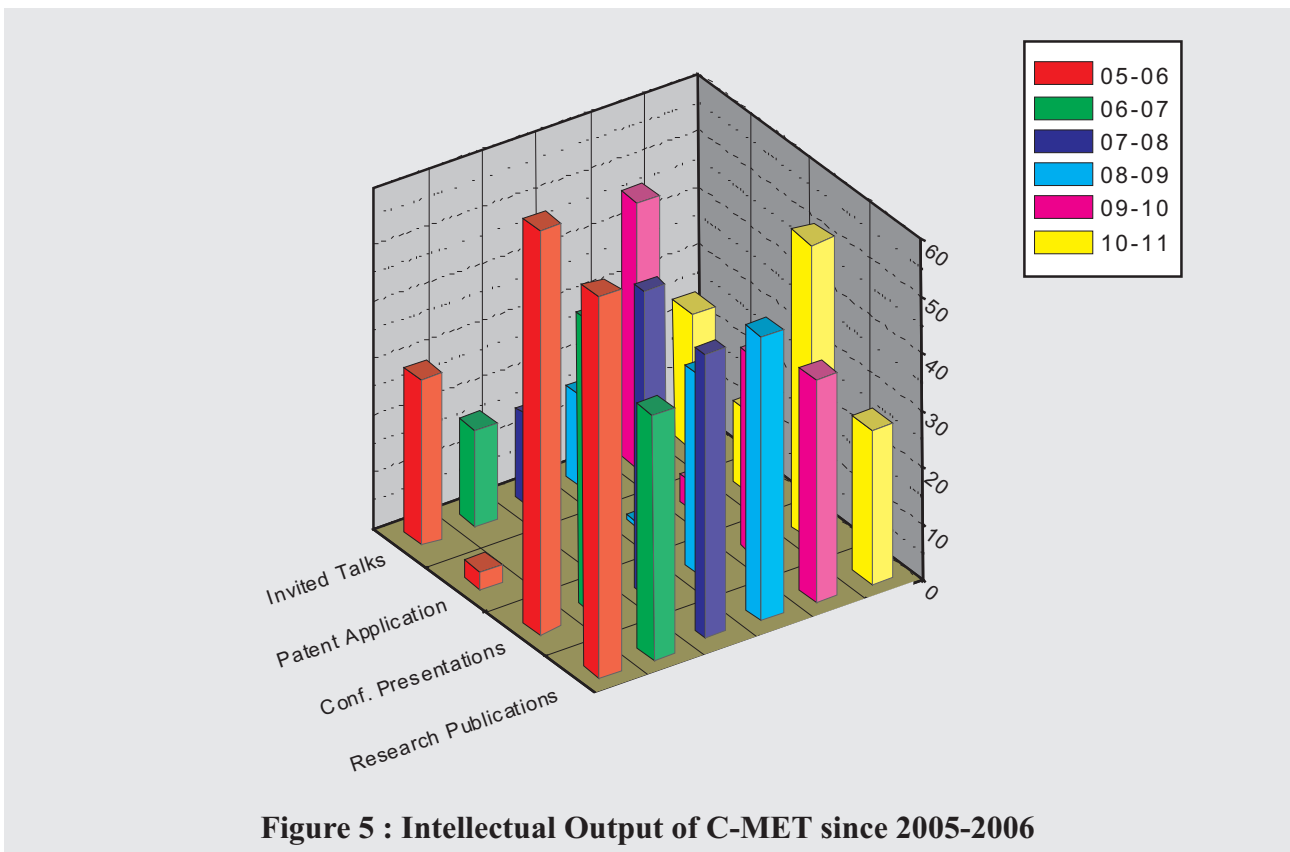


Figure 3 : Sponsored Projects at C-MET Pune, Hyderabad and Thrissur

The growth in IEBR is graphically shown in Figure 4



C-MET has also been enhancing its intellectual output in terms of publications, conference papers, Indian and foreign patents and invited talks -as seen in Figure 5 and Figure 6. The trend clearly evidences better scientific recognition of the R&D capability of C-MET scientists.



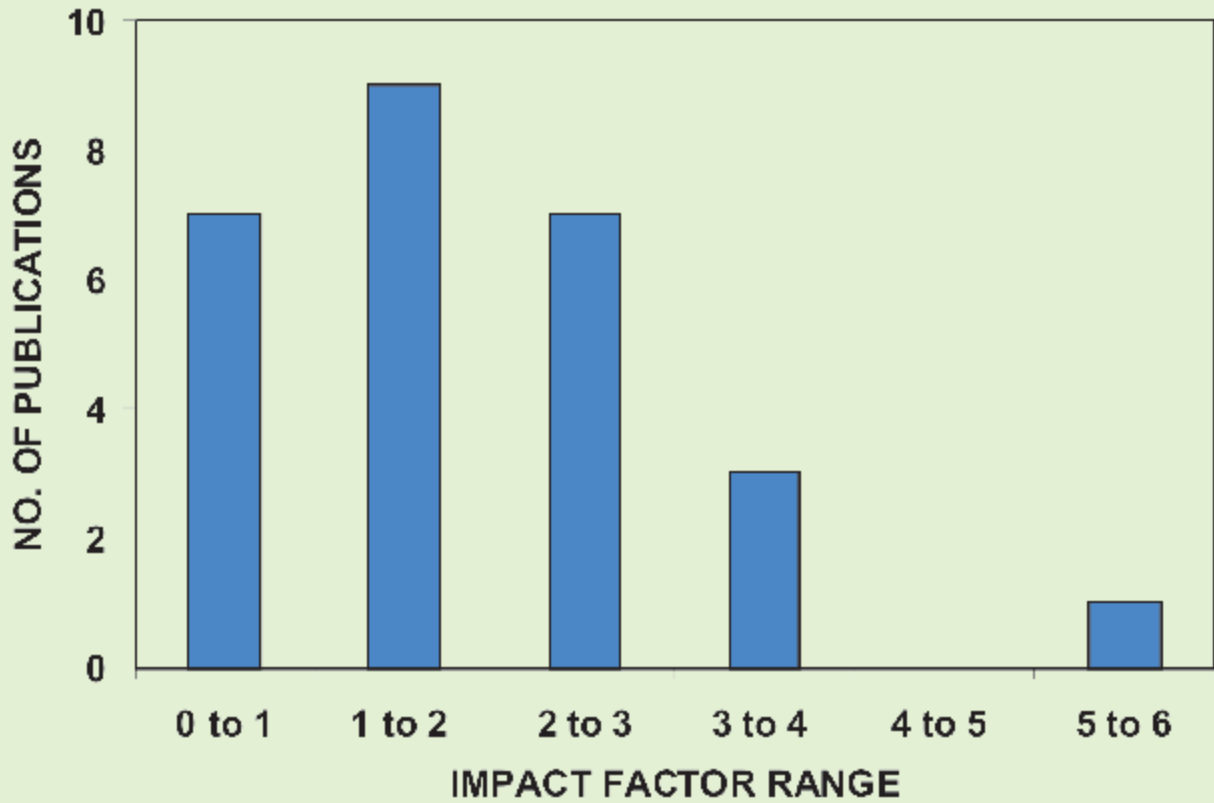


Figure 6 : Publications (2010-11) in Peer-reviewed Journals with Impact Factors

Materials Characterization Services

The expertise and infrastructure developed at C-MET during the previous years, were effectively utilized by providing materials characterization services to outside organizations which included private industries, R&D institutes, strategic sectors and others. C-MET generated an internal revenue of ₹ 4.41 lakhs from materials characterization services for outside samples.

LABORATORYWISE TECHNICAL PROGRESS DURING 2010-11

i) Pune Laboratory

Core Projects :

Developmental activities at C-MET, Pune consist of **Integrated Electronics Packaging and Nano-materials and devices**. The salient features of the progress made during the year 2010-2011 are as follows.

Area	Physical Targets	Achievements
<ul style="list-style-type: none"> Integrated Electronics Packaging 	<ul style="list-style-type: none"> Development of lead-free electroplating bath for solders bumping Selection of appropriate ferrite & dielectric material for LTCC applications 	<ul style="list-style-type: none"> Optimization of soldering process was done for connecting/ soldering the kovar pins and the seal ring to the conductor pads of the LTCC package. Several batches of three types of ferrites were prepared and characterized for their dielectric properties, VSM studies, Squid and XRD analysis.
<ul style="list-style-type: none"> Nanomaterials and Devices 	<ul style="list-style-type: none"> Initial trials and optimization to obtain sub-micron / nano-powders of Ag, Au, Cu, CuO in a Transferred Arc Plasma Reactor Characterization and subsequent processing of glass samples and nanocomposites Preparation of organometallic / inorganic precursors and process development of passivated free standing QDs of IV-VI semiconductors 	<ul style="list-style-type: none"> Al nano particles were synthesized by varying the quench conditions and reactor pressure and characterized by using SEM, AFM and XRD. Developed lead free X-ray absorbing polymer nanocomposites using novel binary (Bi_2S_3) and ternary (BaBi_2S_4) sulphides and optimized the formulation. The characterization of silver selenide samples by IR, XRD, TEM has been completed.

Grant-in-Aid projects:

During this year, following grant-in-aid projects have been implemented.

No.	Title	Funding Agency	Status	₹ (Lakhs)
1	Development of lead free X-ray absorbing materials.	DIT	Completed	107.82
2	Development of solar light driven nanostructured ZnIn ₂ S ₄ photocatalyst for hydrogen generation	DST	Completed	16.42
3	Development of nanostructured semiconductor chalcogenide spinels-visible light photocatalyst for hydrogen generation.	MNRE	Completed	22.40
4	TiO ₂ -Phosphate glass nanocomposite for Nonlinear Optical application.	BRNS	Completed	16.41
5	Development of nanostructured binary spinel sulphides for hydrogen generation using solar energy.	ISRO	Completed	10.21
6	Large-scale generation of Nanosized Metals / Metal Oxides/Metal Nitrides in a Transferred Arc Plasma Reactor	DIT	Completed	418.00
7	Development of 'lead free' thick film thermal sensors using RuO ₂ based nano size complex materials	DIT	Completed	22.40
8	Development of Multilayer LTCC Substrates for Thin Film Gas Sensors	BRNS	Completed	24.74
9	Development of LTCC packages for microcantilever sensors for detection of vapours of explosive chemicals	PSA Office	Completed	35.16
10	Development of a scalable LTCC process for packaging of specific thin film devices	BARC	Completed	49.7
11	Development of feed throughs for packaging of IR detectors	SSPL., DRDO	Completed	9.80
12	Development of microwave components in LTCC	CRL., DEL	Completed	2.70
13	Integrated LTCC packages for MEMS devices and LTCC structural elements	R & D E (Engrs)	On-going	99.0
14	Q-Semiconductor glass nanocomposite for optical and energy (using solar light) applications.	DIT	On-going	451.26
15	AMC and Spares for MEMS FAB equipment at C-MET, Pune	NPMASS	On-going	66.9
16	Development of Advanced Processing capabilities in LTCC	DIT + NPMAS	On-going	816.60
17	Development, production and limited supply of LTCC packaged thin film devices	BARC	On-going	198.70
18	Hybrid solar cells based on organic polymers and inorganic nano particles	DIT	New	100.00
19	Development of green low temperature firable thick film piezoresistive composite pastes for strain gauge applications	ER & IPR, DRDO New Delhi	New	48.35
20	Fabrication of RF circuits as per the specified design on LTCC tile using two different metallizations (Ag based) and mixed (Au and Ag) system	SAC (ISRO)	New	45.0

The consolidated progress in respect of these grant-in-aid projects is furnished below :

Integrated Electronics Packaging :

- Integrated samples (~95mm) were fabricated and submitted for testing
- Completed integration of base and lid for 4 inch size samples
- Final versions of concentrator and explosives detection packages were fabricated (22 Nos each of sensor and preconcentrator) and submitted to IITB
- Under the AMC project, two projects related to LTCC substrate fabrication for microwave application were undertaken and completed successfully. These projects were implemented in collaboration with IIT Delhi and Astra Microwave (P) Ltd, Hyderabad
- First version of Igniter chip was fabricated and submitted for characterization
- First version of 'g' switch was designed and fabricated and submitted for testing
- Developed Kovar preforms and its attachment is in process
- Successfully set-up the novel fabrication process to fabricate LTCC pieces. Submitted 10 samples. All samples found acceptable by SSPL
- New processes for small conductor lines is being set-up by stencil based subtractive method, dispensing process and fine line screen printing
- Fabrication of shrinkage-match independently processes LTCC layers for accurate alignment was completed
- Several microwave passive circuits were fabricated as per design and submitted to the sponsor. Tests showed acceptable results
- First development of micro-cryo-coolers in LTCC has been completed
- Developed lead free thick film NTC thermistor paste composition with sheet resistance of $1\text{K}\Omega/\square$ with thermistor constant of 1200 K.
- Accelerated testing such as humidity, ageing etc. of the films is satisfactory.
- Rod thermistors prepared using the optimised thermistor composition shows $8\text{K}\Omega$ of the device resistance with thermistor constant as 1670 K

Nanomaterials and Devices :

- CdS nanoparticles with different morphology were prepared without capping agent. Initially, spherical CdS particles used to check the efficiency of hybrid solar cell. However, it was noted that the efficiency was 0.15% due to inadequate organic to inorganic ratio.
- CdIn_2S_4 with mixed morphology of flower like & bi-pyramidal structure (200-500 nm) was synthesized.

- Phosphate host glass has been developed and doped with TiO_2 nanoparticles. The White light generation was observed due to TiO_2 doping
- Preparation of CdIn_2S_4 (20-25 gm/batch level) was carried out using hydrothermal route. Characterization results showed the formation of cubic spinel structure with bipyramids on the surface of marigold flower. Hydrogen generation with the rate of 79 ml/hr (which is 3 time higher than bulk CdS) was carried out using these materials.
- Successfully developed Bi_2S_3 -doped phosphate/silicate based glass nanocomposites with 15- 20 nm sized particles embedded in glass matrix.
- Also developed BaSO_4 -PVA nanocomposite via in-situ polymerization process with 50-60 nm sized spherical particles uniformly distributed in polymer matrix.
- Synthesized novel binary oxides and sulphides (BaBi_2S_3 and Ba_2ZrO_4) using hydrothermal and combustion method.
- The formulation was prepared with above materials using commercial colour guard for coating on cotton cloth and various substrates (wood, metal and glass plates) in order to develop prototype apron.
- Developed 10 cm X 10cm sized glass nanocomposite windows.
- The glass windows and prototype apron showed efficient X-ray absorption.
- The hydrogen evolution rates of 3238 and 4374 μmolh^{-1} have been achieved for hydrothermally synthesized CdIn_2S_4 and ZnIn_2S_4 , respectively.
- The ZnIn_2S_4 synthesized using PVP as a capping agent shows excellent photocatalytic activity with rate of 4374 μmolh^{-1} .
- The 715 nm cut-off filters in 60% SiO_2 glass at 200-220 gm batch level have been optimized. The CdSe nanocrystallites have been successfully grown in the silicate glass matrix to achieve 715 nm cut-off filters.

ii) Hyderabad Laboratory

Core Projects:

Developmental activities at C-MET, Hyderabad consists of **Ultra Pure Materials and Compound Semiconductors; Refractory Metals, Alloys and Special Materials**. The salient features of the progress made during the year 2010-2011 are as follows.

Area	Physical Targets	Achievements
<ul style="list-style-type: none"> Ultra high purity materials 	<ul style="list-style-type: none"> Optimization of process parameters for hydro-chemical processing of Ga Optimization of vacuum distillation to achieve 6N+ purity Zn Zone refining of bismuth 	<ul style="list-style-type: none"> 7N grade Ga is prepared and the material is ready for end user trials. 7N grade Zn is prepared and the material is ready for end user trials. 6N pure bismuth is prepared. The material is ready for end user trials.
<ul style="list-style-type: none"> Nanomaterials and devices 	<ul style="list-style-type: none"> Initiation of experiment for preparation of nano tantalum powder & testing 	<ul style="list-style-type: none"> The process for preparation of Ti-Sn oxide nano composite by chemical and physical synthesis route is optimized.

Grant-in-Aid projects :

During this year, the work was continued on following grant- in-aid projects.

No.	Title	Funding Agency	Status	₹ (Lakhs)
1.	Studies on the synthesis and phase transformation of FePt nanoparticles for data storage applications	DST	Completed	24.40
2.	Microwave sintering of refractory metal and alloy powders and properties characterization.	DST	Completed	16.14
3.	Establishment of testing facilities for the hazardous substances as per European Union (EU) directive of Restricted usage of Hazardous Substances (RoHS)	DIT	On-going	522.95
4.	Design and development of controlled melting and freezing system for preparation of ultra-pure crystalline materials for opto-electronics.	DST	On-going	28.39
5.	Ultrahigh quality Silicon Carbide (SiC) single crystals by physical vapor transport (PVT) technique for advanced electronic devices.	DRDO	On-going	767.00
6.	Establishment of extended pilot plant facility at C-MET, Hyderabad for preparation of 320 kg per annum Hafnium	VSSC	On-going	1189.52
7.	Research and development of new materials on the base of recycling of reactive and refractory metals scrap through electron beam method.	DST	On-going	5.73

No.	Title	Funding Agency	Status	₹ (Lakhs)
8.	Environmentally sound methods for recovery of metals from printed circuit boards	DIT	New	188.40
9.	Development of ultra high purity gallium for epitaxial electronic and optoelectronic applications'(Phase-II)	DST	New	5.73

The consolidated progress in respect of these grant-in-aid projects is summarized below:

Ultra High Purity Materials :

- Experiments conducted on chlorination system for temperature profiling and on solvent extraction system for deciding mixer settler suitability for Zr extraction.
- Indigenous batch scale (1000 gm) system for synthesis and preparation of 6N+/7N pure crystalline grade materials was developed/ installed and its performance was tested.
- Microwave sintering experiments conducted with different materials and sintering conditions to understand the microwave material interaction.
- Microwave sintering furnace has been suitably made to sinter refractory metal powders under controlled atmosphere.

RoHS Activities :

- NABL accreditation for Cd, Pb and Cr on AAS is accorded with ISO/IEC 17025: 2005 (T-1780) for chemical testing.
- SOPs for characterization of electronic samples on EDXRF, ICP-MS, GC_MS, IC,UV-Vis Spectrometer for Pb, Cd, Cr⁺⁶, Hg, PBB, PBDE were established.
- National conference on “RoHS regulations and chemical analysis for compliance (RRCA)” was conducted during March 8-9, 2011.

Major R & D Facilitation :

- The Purchase Order for a state of the art sublimation reactor to grow SiC single crystal is placed with M/s. Aixtron, Germany.
- Building drawings for establishment of extended pilot plant facility at C-MET, Hyderabad were finalized, orders placed with CPWD, tender released. Consultants were appointed.
- The analytical procedures on EB Melted samples received from IE-BAS are being studied.
- MoU was signed with an industry namely M/s E-Parisara, Bengaluru for implementing and achieving the project deliverables.
- Contacts made with largest E-waste recycler Umicore, Belgium.
- Phase pure FePt nano particles produced by Fe and Pt salts.

iii) Thrissur Laboratory

Core Projects :

Developmental activities at C-MET, Thrissur consists of **Microwave dielectrics, Multilayer ceramics, Actuators and Sensors, Nanomaterials & Thin films and Aerogels**. The salient features of the progress made during the year 2010-2011 are as follows.

Area	Physical Targets	Achievements
<ul style="list-style-type: none"> Nanomaterials and devices 	<ul style="list-style-type: none"> Development of n type and p type transparent conducting oxide thin films Preparation of nano NTC material for thick film sensors 	<ul style="list-style-type: none"> XRD studies of the CuAlO₂ films revealed the polycrystalline nature of the films with small grain size (~22nm). Developed different B-value material compositions, suitable for thick film sensors and studied its electrical and thermal aging characteristics. Piezoelectric thin films (film thickness = 2.0 μm.) based on PZT with preferential crystallographic orientations {110}, {111}, and {100} have been successfully fabricated on Silicon substrates
<ul style="list-style-type: none"> Piezo sensors and Actuators 	<ul style="list-style-type: none"> Fine tuning of unimorph actuators 	<ul style="list-style-type: none"> ML bender actuators without internal electrodes fabricated.
<ul style="list-style-type: none"> Materials for Renewable Energy 	<ul style="list-style-type: none"> Preparation of carbon aerogel based electrodes for super capacitor applications 	<ul style="list-style-type: none"> Fabricated carbon aerogel based electrodes of thickness 100-120 m. Fabricated aerogel supercapacitor of cell capacitance 0.25 to 1.02 F and evaluated their electrical properties

Grant-in-Aid projects :

During this year, the following grant- in-aid projects have been implemented.

No.	Title	Funding Agency	Status	₹ (Lakhs)
1.	Development of ultra low loss temperature stable composite substrate for high power microwave amplifiers	BRNS	Completed	67.48
2.	Synthesis of nano NTC material and development of chip in glass fast response thermal sensors	DIT	Completed	332.14
3.	Piezoelectric thin films for actuator applications	DST	On-going	19.99
4.	Development, production and supply of microwave substrates for high power microwave amplifiers	BRNS	On-going	150.00
5.	Pilot plant production of 300kg of phase pure Cristobalite for space applications	ISRO	On-going	61.00
6.	Development of cost effective low temperature composition & multilayer actuator for potential automobile /aerospace applications	NPMASS	On-going	57.37

No.	Title	Funding Agency	Status	₹ (Lakhs)
7.	Development of metal nanoparticles doped carbon aerogel based hydrogen gas storage system for fuel cell & other applications	DST	On-going	165.05
8.	Dev. of supercapacitors and applications in electronic circuits	BRNS	On-going	20.51
9.	Development of transparent conducting oxides through solution processes for thin film electronics	BRNS	On-going	22.46
10	Piezoelectric based bimorph mirror	BRNS	On-going	28.78
11.	Preparation of carbon aerogel and development of aerocapacitors for electronics applications	DIT	New	244.43
12.	Development of light triggered graphene/polymer nanocomposite actuators	DST	New	19.47
13.	Design and development of piezoelectric multilayer actuator for MEMS based micro valve	DIT	New	108.26

The consolidated progress in respect of these grant-in-aid projects is summarized below:

Piezo Sensors and Actuators :

- Fabricated high-quality PZT thin films on Silicon for MEMS applications.
- Established Structure-Property relationship in preferentially {100}, {110}, and {111} oriented PZT thin films.
- Successfully developed 5" x 5" size microwave substrates having ultra low loss tangent.
- Cu-cladding technology is being established using vacuum lamination process.
- System level evaluation of the Cu-cladded microwave substrates was performed at 300 W power.
- Augmented the product size of ultra low loss tangent microwave substrates to 19 cm (L) x 13 cm (W) x 0.16 cm (T).
- Constructed 3300 sq. ft. area process laboratory for the pilot plant production of augmented microwave substrates.
- Pilot plant production of microwave substrates initiated.
- High power solid state amplifier fabricated and successfully tested up to 300 W at user agency.
- Prepared 100 grams of phase pure, perovskite, low temperature (900°C) sinterable piezo composition having a strain, k_p , d_{33} and dielectric constant of 0.1%, 0.6, 400 and 2000 respectively.
- Fabricated piezo electric based bimorph mirror for X-ray focusing for RRCAT, Indore.
- Prepared graphite oxide from natural graphite flake. Graphite oxide is reduced by chemical and thermal reduction process.
- Fabricated 2 mm thick multilayer ring actuator

Nanomaterials and Devices :

- Developed chip thermistors having targeted specifications.
- Developed chip in glass fast response thermal sensors.
- Demonstrated the Pilot plant production of chip in glass thermal sensors.

Materials for Renewable Energy :

- Prepared organic aerogels containing 0.12-4.50 wt% of metal ions (Ni & Co) for gas storage applications by sol-gel polymerization followed by supercritical drying.
- Incorporation of metals within the gels network were carried out by following three routes – (i) direct synthesis, (ii) using mixed catalyst and (iii) impregnation of metal ions within the pure aerogels and they were characterized.
- Prepared carbon aerogels, suitable for supercapacitors applications by pyrolysis of organic aerogels, synthesized from resorcinol-formaldehyde gels followed by gel curing, solvent exchange and supercritical drying.
- Fabricated carbon aerogel electrodes for aerogel supercapacitors using different proportions of aerogel powder and binders.
- Prepared copper aluminium oxide thin films by dip coating technique.
- XRD studies of the CuAlO_2 films revealed the polycrystalline nature the films with small grain size ($\sim 22\text{nm}$). Energy band gaps for direct and indirect allowed transitions were ~ 3.72 and 1.82eV respectively.
- Organic gels for the fabrication of aerocapacitor were prepared by sol-gel polymerization of resorcinol & formaldehyde using different proportions of catalyst.
- As-prepared gels were cured and exchange of pore liquids were carried out with acetone.

IMPORTANT EVENTS

ANNUAL FOUNDATION DAY & RRCA - 2011

CMET celebrated its Annual Foundation Day on 8th March 2011 at Katriya Hotel & Towers, Hyderabad. As a part of its Annual Foundation Day celebration, C-MET has organised a national conference on “RoHS Regulations & Chemical Analysis for Compliance (RRCA-2011) during March 8-9, 2011 to promote the awareness on Restriction of Hazardous Substances (RoHS) for export of electronic and related goods to European Union. The conference was focussed on the young researchers in the field of chemical analysis and/or materials science to gain the knowledge base on toxicity levels of various elements and compounds such as cadmium, lead, mercury, hexavalent chromium and Poly Brominated Diphenyl Ethers (PBDEs) and Poly Brominated Biphenyls (PBBs). PBDEs, a subgroup of brominated flame retardants, are persistent and bioaccumulative industrial chemicals that cause numerous problems including cancer, thyroid disorders & neuro-developmental effects.

The presidential address was given by Shri R. N. Jayaraj, Chief Executive, NFC, Hyderabad. Dr S. P. Vasireddy, CMD, Vimta Labs, Hyderabad was the chief guest. Dr. Lakshmi Raghupathy, Advisor, GIZ-MAIT, New Delhi has given the key note lecture entitled “ RoHS regulations and its impact on Indian Electronics Industry”. Around 250 delegates from industries, young researchers, students, academicians from reputed institutions and universities and scientists from national laboratories have attended the conference.



Dr S. P. Vasireddy, CMD, Vimta Labs, Hyderabad, lighting the lamp on the occasion of Annual Foundation Day and National conference on “RoHS Regulations and Chemical Analysis for Compliance (*RRCA-2011*) at C-MET Hyderabad.

INAUGURATION OF MICROWAVE MATERIALS PROCESSING LABORATORY

A pilot plant production facility for the limited production of critical microwave materials required for strategic atomic energy applications was inaugurated by Dr. Srikumar Banerjee, Chairman, Atomic Energy Commission, Government of India on 28th January, 2011 at C-MET, Thrissur. The ultra low loss micro wave substrates produced in this facility will be used for the fabrication of high power solid state amplifiers at Raja Ramanna Centre for Advanced Technology (RRCAT), a Department of Atomic Energy (DAE) unit located at Indore. Currently, low loss microwave substrates are available only from the imported sources. Since these materials are used for missile guidance and satellite navigation, they fall under the embargo category. Understanding the strategic importance of these materials, C-MET has succeeded in developing novel ceramic filled PTFE based planar substrates with proprietary dielectric properties which can work beyond 250 W through an indigenously developed “SMECH process”. The Cu-cladded microwave substrates of size 19 cm (L)x 13 cm (B) x 0.16 cm (T) delivered to RRCAT have qualified system level evaluation and high power amplifiers were fabricated using indigenously developed microwave circuit boards. The solid state amplifiers operating at a center frequency of 352 MHz were successfully tested at 700 watts, which is more than twice the full rated power of 270 W. The performance of the indigenously developed microwave circuit boards in terms of out power, gain and efficiency was found to be excellent. The inaugural function was presided over by the Executive Director, Dr. Dinesh P. Amalnerkar. Welcome speech on this occasion was delivered by Dr. K.R. Dayas, Director, C-MET, Thrissur and special address was given by Dr. R.K. Bhandari, Director, VECC, Kolkata and Shri. S.G. Markandeya, Scientific Secretary, BRNS, Mumbai.



Dr. Srikumar Banerjee, Chairman, Atomic Energy Commission inaugurating the Homi Bhabha Birth Centenary Memorial Process Laboratory for Microwave Materials at C-MET, Thrissur.

ORGANIZATION OF INTERNATIONAL CONFERENCES / WORKSHOP etc.

- C-MET, Pune has successfully organized **International Workshop and Symposium on Synthesis and Characterization of Glass /Glass Ceramics (IWSSCGGC-2010)** during 7-10 July, 2010 in collaboration with Materials Research Society of India (MRSI) Pune, Mumbai, Kolkata and Gujarat Chapters.
- C-MET, Pune has participated in organizing **International Conference on NANO Technology Materials & Composites for Frontier Applications (NANOCON-2010)** during 14-15 October, 2010 in collaboration with Bharati Vidyapeeth University, Pune, North Carolina A & T State University, USA and Tuskegee University, USA.
- C-MET, Pune has successfully organized **International Symposium on Materials Education (ISME-2011)** during 26-28 March, 2011 in collaboration with Indian Institute of Science Education and Research (IISER), Pune, National Chemical Laboratory (NCL), Pune and Defence Institute of Advanced Technology (DIAT), Pune.



Hon'ble Science and Technology Minister **Shri Prithvirajji Chavan**
releasing the Souvenir of NANOCON-2010



International Workshop and Symposium on Synthesis and Characterization of Glass /Glass Ceramics (IWSSCGGC-2010)



International Symposium on Materials Education (ISME-2011)

NATIONAL TECHNOLOGY DAY CELEBRATION

C-MET, Thrissur celebrated the National Technology Day 2010 during June 1-3, 2010 and conducted various programmes such as science quiz, popular lecture followed by demonstration of advancement of technologies, group discussion by academicians from universities/colleges, science slide show and exhibition of product/demonstration of technologies developed at C-MET. This event was partly supported by Kerala State Council for Science, Technology & Environment (KSCSTE).



Dr. G. J. Samathanam (left), Advisor & Head, Technology Development & Transfer Division of DST, Govt. of India and **Dr. Suresh Das** (right), Director, National Institute of Interdisciplinary Science & Technology (NIIST), Thiruvananthapuram delivering the keynote address and technology day lecture in National Technology Day celebration function at C-MET, Thrissur.

SIGNING OF MoUs

- MoU was signed on 9th November 2010 between C-MET & E-Parisaraa, Hyderabad for monitoring and other matters related to the project “Environmentally Sound Methods for Recovery of Metals from Printed Circuit Boards”.



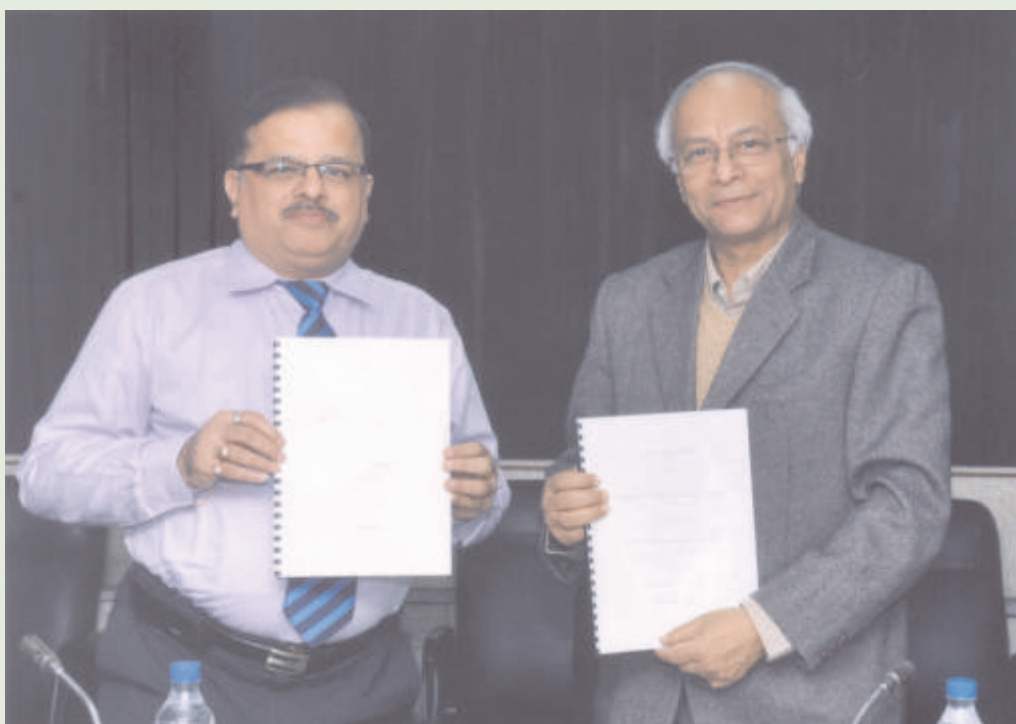
Mr. M. Parthasarathy, Director, E-Parisaraa, Hyderabad, handing over the MoU to **Dr. D. P. Amalnerkar**, ED, C-MET in the presence of **Dr. S. Chatarjee**, DIT, Delhi

- MoU was signed on 29th November 2010 between C-MET & Moser Baer India Ltd., New Delhi.



Dr. Giriraj Nyati, Sr. Vice-President, Moser Baer India Ltd. and **Dr. D. P. Amalnerkar**, Executive Director, C-MET signing MoU

- MoU was signed on 6th December 2010 between C-MET and National Research Development Corporation (NRDC), New Delhi.



Dr. Somenathan Ghosh, Chairman and Managing Director, NRDC and **Dr. D. P. Amalnerkar**, Executive Director, C-MET handing over the MOU

DISTINGUISHED VISITORS

- Eminent academician and internationally acclaimed Nano-BioTechnologist Prof. V. Renugopala-krishnan, Harvard, Boston USA, visited C-MET, Pune and Thrissur in October 2010 and delivered lectures at both the centers.
- Dr. James Ryan Founding Dean, Joint School of NanoScience and Nanoengineering, The University of North Carolina, Greensboro visited C-MET Pune in October 2010.
- German Delegation - Mr. Alexander Schwock, BalticNet Plasma Tec Association, Ms. Katherina Ulrich, Balticnet-Plasma Tec Association, Ms. Manuela Glawe, Leibniz Institute for Plasma Sciences and Technology, Dr. Volkar Brusser Leibniz Institute for Plasma Science and Technology, Dr. Jan Heeg, Institute of Surface and Thin Film Technology, Dr. Daniel Rohde, Dresden Transfer Centre for vacuum Technology, Mr. Abhijit Majumdar, University of Greenswald, Department of Physics visited C-MET, Pune in October 2010.
- Mr. Eric Bouchard, Business Development Manager, Tekna Plasma Systems Inc, Sherbrooke, Canada visited C-MET, Pune in November 2010.
- Dr. Matjaz Valant, University of Nova Gorica, Materials Research Laboratory & Dr. Anna Axelsson, Research Fellow, Department of Materials, Imperial College, London visited C-MET, Pune in March 2011.
- Mr. Hideyuki Imai, Researcher, Microelectronics laboratory, Faculty of Engineering, Kyoto University, Japan visited Thrissur laboratory to work at the PZT thin films laboratory of Dr. V. Kumar on the fabrication of piezoelectric thin films for MEMS applications during the period 27th November 2010 – 18th December 2010. He also delivered a lecture on “*A Study of piezoelectric thin films for their MEMS applications*”.
- Prof. G Mohan Rao (Professor, Department of Instrumentation and Applied Physics, Indian Institute of Science) visited C-MET, Thrissur on 2nd July 2010 and delivered a lecture on “*Thin Film Batteries*”
- Dr. Satish V. Kailas, Professor of Mechanical Engineering, Indian Institute of Science visited C-MET Thrissur on 25th February, 2011
- Dr. Paresch C. Ray Professor, Department of Chemistry of Jackson State University, MS, USA visited C-MET, Thrissur and delivered a talk on “*Gold Nanomaterials based Selective Sensing, Targeted Nano-Therapy and Monitoring Therapy Process of Cancer Cells and Drug Resistance Bacteria*” on 25th February, 2011
- Dr. Farook Adam, Professor in Chemistry, School of Chemical Sciences, University Sains Malaysia visited C-MET, Thrissur on 30th January, 2011 and delivered a lecture on “*Material Science Research at School of Chemical Sciences, USM*”
- Prof. Johannes Bernardi, Prof. Hubert Brucki, Prof. Ille Gebeshuber, Dr. Ewald Badisch, Dr. Thomas Koch from Vienna University of Technology, Austria visited C-MET, Hyderabad on 9th December 2010 to explore the possibility of potential technical collaboration.
- Dr. V. K. Aatre, former Scientific Advisor to Raksha Mantri, visited C-MET, Pune in January 2011.
- Dr. R. K. Arora, Group Director, SAC Ahmedabad, visited C-MET, Pune to have a look at the LTCC facility and to explore collaborative development



Dr. Renugopalakrishnan delivering lecture at C-MET, Thrissur



Delegates from Vienna University of Technology, Austria visited C-MET, Hyderabad



Prof. Matjaz Valant and Dr. Anna Axelsson visited C-MET, Pune



Visit of German Delegation to C-MET, Pune

VISITS ABROAD DURING THE YEAR

- Dr. D. P. Amalnerkar visited King Saud University and King Abdullah Institute of Nano Technology (KAIN), Saudi Arabia in June 2010.
- Dr. B. B. Kale and Dr. M. V. Kulkarni visited “Hitachi-High Technologies Corporation”, Japan for the Advanced Training Course in Operation and Maintenance of S-4800, Field Emission Scanning Electron Microscope (FE-SEM) during, 18th -22nd October 2010.

PUBLICATIONS

I) IN PEER-REVIWED JOURNALS

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4. Synthesis of uncapped silver nanoparticles using DC arc plasma technique: effect of change in plasma gas on morphological properties, Manish D. Shinde, Amol U. Pawar, Soumen Karmakar, Tanay Seth, Varsha B. Raut, Sunit Rane, A. K. Das, Sudha V. Bhoraskar, Dinesh P. Amalnerkar, *International Journal of Nanotechnology*, 7 No. 9-12, (2010)1054.
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9. Nanosize SnO₂ based tubular resistive gas sensor for hydrogen and acetone vapour, Salim F. Bamsaoud, Sunit B. Rane, and R. C. Aiyer, *Transactions of the Indian Ceramic Society, Special Issue on "Advanced Nanoceramic Materials and Future Trend"*, 69, 3 (2010) 193.
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12. Tunability of third order nonlinear absorption in PLZT thin films, D. Ambika, V. Kumar, C. S. Suchand Sandeep, R. Philip, *Appl. Phys. Lett.*, 98 (2011) 011903.
13. Effect of particle size variation of Ag nanoparticles in Polyaniline composite on humidity sensing, Madhavi Fuke, Prajakta Kanetkar, Milind Kulkarni, B. B. Kale, R. C. Aiyer, *Talanta*, 81 (2010) 320.
14. Hierarchical Nanostructures of CdIn₂S₄ via Hydrothermal and Microwave Method: Efficient solar light driven photocatalyst, Sanjay K. Apte, Sunil N. Garaje, Rohini D. Bolade, Jalindar D. Ambekar, Milind V. Kulkarni, Sonali D. Naik, Suresh W. Gosavi, Jin Ook Baeg and Bharat B. Kale, *Journal of Materials Chemistry* 20 (2010) 6095.

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27. Microwave dielectric properties of low temperature sinterable $\text{BaCe}_2(\text{MoO}_4)_4$ ceramics, Nijesh K. James, R. Ratheesh, *J. Amer. Cer. Soc.*, 93 (2010) 931.

ii) IN INTERNATIONAL AND NATIONAL CONFERENCES / SYMPOSIA

1. One-pot synthesis of semiconducting PbS nanorods in polyphenylene sulphide matrix, Sujata Waghmare, Parag Adhyapak, Manish Shinde, Ramkrishna Gholap, Uttam Mulik, Dinesh Amalnerkar, *International Conference on Nanotechnology - Materials and Composites for Frontier Applications*, Pune, India, 14-15th October (2010).
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 8. Nano-Silver based Conductive adhesive formulations for Electronics applications, M. V. Kulkarni, R. Marimuthu, S. D. Naik, S. K. Apte, R. S. Sonawane, S. B. Rane, U. P. Mulik, D. P. Amalnerkar, J. D. Ambekar and B. B. Kale, International Conference on Nanotechnology - Materials & Composites for Frontier Applications (Nanocon 2010), Pune, 14-15 October (2010).
 9. Microwave assisted synthesis of Silver nanoparticles and Conductive thick films, Rushna Bhatkar, Sudhir Arbuji, Uttam Mulik, Dinesh Amalnerkar and Sunit Rane, International Conference on Nanotechnology- Materials & Composites for Frontier Applications (Nanocon 2010), Pune, 14-15 October (2010).
 10. Ink Jet Printable Conducting Polyaniline Ink for Flexible Organic Electronics, Milind V. Kulkarni and Bharat B. Kale, LOPE-C Large-area Organic & Printed Electronics Convention, Frankfurt, Germany, May 31 – June 2 (2010).
 11. Fabrication & Characterization of silver Vanadium Oxide–Polyaniline (SVO-PANI) nanocomposite, Rahul S. Diggikar, Milind V. Kulkarni & Bharat B. Kale, International Workshop & Symposium on the Synthesis & Characterization of Glass/ Glass –Ceramics (IWSSCGGC-2010), Pune, India, July 7-10 (2010).
 12. Magnetic behaviour of Bi₂S₃ doped glass matrix, Rajendra P. Panmand, Ujjwala V. Kawade, Sanjay K. Apte, Milind V. Kulkarni, Bharat B. Kale and S. W. Gosavi, International Workshop and Symposium on the Synthesis and Characterization of Glass/ Glass –Ceramics (IWSSCGGC-2010), Pune, India, July 7-10 (2010).
 13. Studies of Silver-Polyaniline nanocomposite, Shamkuar P. Deshmukh, Mohini A. Jagtap, Milind V. Kulkarni and Bharat B. Kale, International Workshop and Symposium on the Synthesis and Characterization of Glass/ Glass –Ceramics (IWSSCGGC-2010), Pune, India, July 7-10 (2010).
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15. Synthesis of TiO₂-Phosphate Glass Nanocomposite and its Optical Study, J. D. Ambekar, Y. S. Sonawane, S. D. Naik, R. Marimuthu, R. S. Sonawane, S.K. Apte, M. V. Kulkarni, G. P. Kothiyal and B. B. Kale, International Workshop and Symposium on the Synthesis and Characterization of Glass/ Glass –Ceramics (IWSSCGGC-2010), Pune, India, July 7-10 (2010)..
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17. Synthesis of Highly Crystalline Silver Nanorods for Flexible Electronics, Mohini A. Jagtap, Milind V. Kulkarni, Jalindar D. Ambekar & Bharat B. Kale, International Workshop & Symposium on the Synthesis and Characterization of Glass/ Glass –Ceramics (IWSSCGGC-2010), Pune, India, July 7-10 (2010).
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19. Synthesis and Spectroscopic Characterization of Polyaniline-Multi-Walled Carbon Nanotubes (PANI-MWCNT) Nanocomposites via In-situ Polymerization” Mohseen S. Tamboli, Milind V. Kulkarni, J. D. Ambekar and Bharat B. Kale, International Conference on Nanotechnology - Materials and Composites for Frontier Applications, Pune, India, 14th and 15th October (2010).
20. Highly Transparent Polyaniline- Multi-Walled Carbon Nanotube (PANI-CNT) Nanocomposite., Milind V.Kulkarni, Bharat B. Kale Kalpesh Bhavsar, Nitin Charhate, Minal Tathe International Conference on Nanotechnology - Materials and Composites for Frontier Applications, Pune, India, 14th and 15th October (2010).
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22. Preparation and Characterization of Silver nanorods by Polyvinylpyrrolidone-assisted Polyol Reduction, Mohini A. Jagtap, Milind V. Kulkarni and Bharat B. Kale, International Conference on Nanotechnology - Materials and Composites for Frontier Applications. Pune, India, 14th and 15th October (2010).
23. Architecture of CdIn₂S₄ nanostructures and its functionality as a visible light photocatalyst for organic dye degradation, Sunil N. Garaje, Sanjay K. Apte, Milind V. Kulkarni, R. S. Sonawane, Sonali D. Naik, and Bharat B. Kale, International Conference on Nanotechnology - Materials and Composites for Frontier Applications, Pune, India, 14th and 15th October (2010).
24. Nanocrystalline Zinc Indium Vanadate: A Novel Photocatalyst for Hydrogen Generation, Sonali A. Mahapure, Jalindar .D. Ambekar, Latesh K. Nikam, Milind V. Kulkarni, and Bharat B. Kale, International Conference on Nanotechnology - Materials & Composites for Frontier Applications, Pune, India, 14th and 15th October (2010).
25. Synthesis , Characterization and Photocatalytic Activity of Nanosized ZnS, R. D. Bolade, S. K. Apte, R. Marimuthu, R. S. Sonawane, S. D. Naik, M. V. Kulkarni and B. B. Kale, DAE-BRNS 3rd International Symposium on materials Chemistry, Mumbai, India, December 7-11, (2010).

26. Synthesis and Characterization of Zinc Silver Antimonate and its functionality as a Photocatalyst, S.A. Mahapure, R. D. Bolade, R. Marimuthu, L. K. Nikam, J. D. Ambekar, M. V. Kulkarni and B. B. Kale, DAE-BRNS 3rd International Symposium on Materials Chemistry, Mumbai, India, December 7-11, (2010).
27. Synthesis, characterization and Humidity sensing properties of Sulphonic acid doped poly (o-anisidine) Milind V. Kulkarni, S.K. Apte, S.D. Naik, and B. B. Kale, National seminar on Physics and Technology of Sensors, NSPTS-15, University of Pune, Pune India, March 2-6, (2010).
28. Preparation of carbon aerogels and studies on the role of catalyst concentration in tuning the electrical properties of aerogel supercapacitors, R. Rakhikrishna, P. Hareesh, P.A. Abraham, N. Rani Panicker, K. Stanly Jacob, and N. C. Pramanik, National Conference on Nano Structured Materials and Nanocomposites (NCNM 2010), Ottapalam, Kerala, 17- 18 March, (2011).
29. Co-doped carbon aerogels: Synthesis, characterization and study of their gas sorption properties, M. S. Sruthy, Nidhin Soman, P. A. Abraham, N Rani Panicker, K. Stanly Jacob, and N. C. Pramanik, National Conference on Nano Structured Materials and Nanocomposites (NCNM 2010), Ottapalam, Kerala, 17- 18 March, (2011).
30. Synthesis and characterisation of Ni-doped carbon aerogels for energy storage applications, N. C. Pramanik, P. A. Abraham, N. Rani Panicker, N. Soman, and M. S. Sruthy, International Workshop & Symposium on Synthesis and Characterization of Glass/Glass-ceramics (IWSSCGGC-2010), Pune, July 7-10, (2010).
31. New method of synthesizing crystalline BST nanoparticles and study of their dielectric properties, N. C. Pramanik, P. A. Abraham, and N. Rani Panicker, International Workshop & Symposium on Synthesis & Characterization of Glass/Glass-ceramics (IWSSCGGC-2010), Pune, July 7-10, (2010).
32. Synthesis and Characterization of Graphene- PDMS Nanocomposite, R. Manjari, K. R. Dayas, E. K. Sunny, A. Seema, M. N. Muralidharan, National Conference on Nano Structured Materials and Nanocomposites (NCNM 2010), Ottapalam, Kerala, 17- 18 March, (2011).
33. Preparation and characterization of graphene PTFE composite, P. M. Manikandan K. R. Dayas, E. K. Sunny, A. Seema, M. N. Muralidharan, National Conference on Nano Structured Materials and Nanocomposites (NCNM 2010), Ottapalam, Kerala, 17- 18 March, (2011).
34. Bulk synthesis of graphene by chemical route, C. Rahima, M. N. Muralidharan, E. K. Sunny, K. R. Dayas, A. Seema, National Conference on Nano Structured Materials and Nanocomposites (NCNM 2010), Ottapalam, Kerala, 17- 18 March, (2011).
35. Self propagated high temperature synthesis of nano manganese chromite and characterization of the powder, Sr. K. A. Stella, K. R. Dayas, K. Krishnan Kutty and A. Seema, National Conference on Nano Structured Materials and Nanocomposites (NCNM 2010), Ottapalam, Kerala, 17-18 March, (2011).
36. Comparative study of electrical properties of NTC disc thermistors made by attritor milled and ball milled powder, M. A. Ajeesh, P. R. Rohini, E. K. Sunny, A. Seema, K. R. Dayas, International Workshop & Symposium on Synthesis & Characterization of Glass/Glass-ceramics (IWSSCGGC-2010), Pune, 7-10 July, (2010).
37. Optimization of process parameters for the preparation of Ni Mn Co_{0.7}Fe_{0.3}O₄ NTC chip thermistors, K. R. Resmi, A. Seema, K. R. Dayas, International Workshop & Symposium on Synthesis and Characterization of Glass/Glass-ceramics (IWSSCGGC-2010), Pune, July 7-10, (2010).
38. Lanthanum oxide doped nickel-manganite based NTC thermistors, A.K. Sini, M.N. Muralidharan, A. Seema, K. R. Dayas, International Workshop & Symposium on Synthesis and Characterization of Glass/Glass-ceramics (IWSSCGGC-2010), Pune, 7-10 July, (2010).

39. A study on glass passivation of NTC chip thermistors, M. Dileep, A. Seema, K.R. Dayas, International Workshop & Symposium on Synthesis and Characterization of Glass/Glass-ceramics (IWSSCGGC-2010) Pune, 7-10 July, (2010).
40. Dispersion studies of Ni – Mn – Cr – Fe – Cu – O NTC thermistor material slips, P.R. Rohini, M. N. Muralidharan, E. K Sunny, A. Seema, K. R. Dayas, International Workshop & Symposium on Synthesis & Characterization of Glass/Glass-ceramics (IWSSCGGC-2010), Pune, 7-10 July, (2010).
41. Synthesis of hydration resistant low alkali borosilicate glass for LTCC application, C. J Dileep Kumar, N. Raghu, N. Venkataramani and Ajit R. Kulkarni, International Workshop & Symposium on the Synthesis and Characterization of Glass/Glass-Ceramics (IWSSCGGC-2010), Pune, 7-10 July, 2010
42. Crystallization behavior of Ca-Al-borosilicate glass+ceramic LTCC compositions, C. J Dileep Kumar, N. Raghu, N. Venkataramani and Ajit R. Kulkarni, International Workshop & Symposium on the Synthesis and Characterization of Glass/Glass-Ceramics (IWSSCGGC-2010), Pune, 7-10 July, 2010
43. Influence of thickness ratio between piezoelectric bimorph and that of fused silica plate on the radii of curvatures of Bimorph piezoelectric mirror, M. Libu, S. Susanth, K. G. Vasanthakumari, C. J. Dileep Kumar and N. Raghu, National Conference on Sensors and Actuators: Science to Technology (NCSA-11), Kolkata, 11-12 March, (2011).
44. Transparent conducting aluminium doped zinc oxide thin films prepared by solution process, M. S. Sajna, I. Packia Selvam, & S. N. Potty, International Workshop & Symposium on the Synthesis and Characterization of Glass/Glass-ceramics (IWSSCGGC-2010), Pune, 7-10 July, (2010)
45. Preparation of copper aluminium oxide films by dip coating, M Karthika, T. M. Sudheesh, I. Packia Selvam and S. N. Potty, International Workshop & Symposium on the Synthesis and Characterization of Glass/Glass-ceramics (IWSSCGGC-2010), Pune, 7-10 July, (2010).
46. Solvent extraction of Hafnium, Raghu C. Reddy, Arbind Kumar, T. L. Prakash; 48th National Metallurgist Day, organized by Indian Institute of Metals (NMD-ATM 2010), IISc., Bangalore, 14-16 November (2010).
47. Screening and quantification of environmentally hazardous substances (Pb, Cd, Cr⁶⁺, Hg & Br) in electronic waste by EDXRF, IC and ICP - OES according to RoHS Directive, U. Rambabu, N. R. Munirathnam, M. R. P. Reddy, T. L. Prakash, 48th National Metallurgist Day, organized by Indian Institute of Metals (NMD-ATM 2010), IISc., Bangalore, 14-16 November (2010).
48. Environmental hazardous chromium speciation in magnetic material tapes by UV-Vis Spectrophotometer, K. S. Lakshmi, Ch. Sudheer, U. Rambabu, N. R. Munirathnam, M. R. P. Reddy, T. L. Prakash, 48th National Metallurgist Day, organized by Indian Institute of Metals (NMD-ATM 2010), IISc., Bangalore, 14-16 November (2010).
49. The determination of hazardous substances Pb, Cd, Cr, Hg & Br in plastic number beads to comply with RoHS Directive, U. Rambabu, N. R. Munirathnam, M. R. P. Reddy, T. L. Prakash, 22nd AGM MRSI, AMPRI, Bhopal, 14-16 February, (2011).
50. Analysis of Hexavalent chromium in electrical cable identification beads using UV-Visible Spectrometer, K. S. Lakshmi, B. Mahender, Ch. Sudheer, U. Rambabu, M.R.P. Reddy, N. R. Munirathnam, T. L. Prakash, 22nd AGM MRSI, AMPRI, Bhopal, 14-16 February, (2011).
51. Lead, Cadmium, Chromium and Mercury determination by Microwave assisted atomic absorption spectrometry, Ch. Appala Naidu, R. Govindaiah, U. Rambabu, M. R. P. Reddy, N. R. Munirathnam, T. L. Prakash, 22nd AGM MRSI, AMPRI, Bhopal, 14-16 February, (2011).

52. Analysis of polybrominated Biphenuls and Polybrominated Diphenyl Ethers in Computer key boards using Gas Chromatography Mass Spectrometry, K. Ramaswamy, R. Govindaiah,, U. Rambabu, M. R. P. Reddy, N. R. Munirathnam, T. L. Prakash, 22nd AGM MRSI, AMPRI, Bhopal, 14-16 February, (2011).

iii) PATENTS APPLIED

1. Stabilized bimetallic nanostructures for humidity sensing and process for their preparation, Parag Adhyapak, Rohini Aiyer, Uttamrao Mulik and Dinesh Amalnerkar (Filed an Indian Patent) (Patent application No. 1836/MUM/2010 dt. 21 June 2010).
2. A micro/ nano photoconductor, G. Umarji, D. P. Amalnerkar, U. P. Mulik and S. W. Gosavi (Filed an Indian Patent) (Patent application No. 1561/MUM/2010 dt. 18 May 2010).
3. Humidity sensing performance of in-situ fabricated Cu/Cu₂O/Cu₂S – polymer nanocomposite via PPS cyclization route, D. S. Adkar, A. Hake, S. R. Jadkar, P. V. Adhyapak, U. P. Mulik and D. P. Amalnerkar (Patent application No. 247/MUM/2010 dt. 28 January 2011).
4. Microwave assisted processing of silver conductive thick films, S. B. Rane, D. P. Amalnerkar and U. P. Mulik (Filed provisional Indian Patent) (Patent application No. 275/MUM/2010 dt. 1 February 2011).
5. Synthesis of nanostructures of metal doped Cadmium Sulphide, Manish Shinde, Sunit Rane and Dinesh Amalnerkar (Filed provisional Indian Patent) (Patent application No. 3235/MUM/2010, dt. 26 November 2010)
6. Joule Thomson Cryocooler using LTCC technique, Milind D Atrey, Prasanna Gandhi and Girish Phatak – Indian patent applied.
7. Composite layered ceramic armour, Kiran Akella, and Girish Phatak – Indian patent applied.
8. Miniature PEM fuel cells using LTCC packaging, Shekhar Dimble, Shrikant Kulkarni, Girish Phatak and S. Duttagupta – Indian patent applied.
9. Development of Ink-jet printable aqueous conducting polyaniline based ink for flexible electronics application, Milind V. Kulkarni, Bharat B. Kale, Sanjay K. Apte, Sonali D. Naik, Ravindra S. Sonawane, Jalindar D. Ambekar, R. Marimuthu – Indian patent applied.
10. Low temperature large scale synthesis of CdS nanostructures by facile solid state reaction and their excellent photocatalytic performance for hydrogen generation, Sanjay K. Apte, Sunil N. Garaje, Bharat B. Kale, Sonali D. Naik, Jalindar D. Ambekar, Ravindra S. Sonawane, Milind V. Kulkarni – Indian patent applied.
11. Development of phosphate-zincate host glass based nanocomposite for supercontinuum, Bharat B. Kale, Jalindar D. Ambekar, Sonali D. Naik, Suresh W. Gosavi, Sanjay K. Apte, Ravindra S. Sonawane, Milind V. Kulkarni – Indian patent applied.
12. Development of solar light driven nanostructured ZnIn₂S₄ photocatalyst for hydrogen generation, Bharat B. Kale, Ravindra S. Sonawane, Nilima S. Chaudhari, Ashwini P. Bhirud, Latesh K. Nikam, Milind V. Kulkarni, Sonali D. Naik, Sanjay K. Apte, Jalindar D. Ambekar – Indian patent applied.
13. Novel large scale synthesis of ZnS nanostructures by facile solid state method and their photocatalytic activity for hydrogen production via water splitting, Sanjay K. Apte, Sunil N. Garaje, Sudhir S. Arbuj, Bharat B. Kale, Uttamrao P. Mulik, Sonali D. Naik, Jalindar D. Ambekar, Ravindra S. Sonawane, Milind V. Kulkarni – Indian patent applied.

14. Development of polyaniline-MWCNT coated electronic fabrics (E-Fabrics) / smart fabrics for wearable electronics by simple dipping and drying process, Milind V. Kulkarni, Bharat B. Kale, Sanjay K. Apte, Sonali D. Naik, Jalindar D. Ambekar and Ravindra S. Sonawane – Indian patent applied.

iv) INVITED LECTURES BY C-MET SCIENTISTS

1. Dr. D. P. Amalnerkar has delivered National Technology Day Lecture at Research & Development, Engineers, Dighi (DRDO) on 11th May 2010.
2. Dr. D. P. Amalnerkar has delivered series of lectures on Nanotechnology in Department of Physics and Astronomy Engineering, College at King Saud University and King Abdullah Institute of Nano Technology (KAIN), Saudi Arabia in June 2010.
3. Dr. D. P. Amalnerkar has delivered invited talk in Indo Austria Conference at Hyderabad on 7th December 2010.
4. Dr. D. P. Amalnerkar has delivered special lecture on C. V. Raman at Physics Department, Shivaji University, Kolhapur on 26th December 2010.
5. Dr. D. P. Amalnerkar has delivered invited talk in the International Conference on Nanoscience and Nano Technology – 2011 organised at Swami Ramanand Teerth Marathwada University, Nanded on 10th January 2011.
6. Dr. D. P. Amalnerkar has inaugurated Two day Seminar on Frontier Technology organized by Rayat Shikshan Sanstha's R.B. Narayan Rao Borav College, Shriampur, District Ahmednagar and delivered lecture on 'Frontiers in Chemistry' on 23rd January 2011.
7. Dr. D. P. Amalnerkar has formally inaugurated the academic activities of Department of Nano-Science and Technology University of Calicut and delivered Frontier lecture entitled 'Synthesis of functional Nanomaterials' on 17th February 2011.
8. Dr. U. P. Mulik delivered an invited talk on "Polymer nanocomposites" in the workshop on 'Nanomaterials and Nanoscience-Current status & Challenges' organized by KIT's College of Engineering, Kolhapur on June 15, 2010.
9. Dr. U. P. Mulik delivered an invited talk in the Short-Term Training Programme/Workshop on 'Diverse Aspects of Nanoscience & Technology' organized by the Department of Chemical Technology, North Maharashtra University, Jalgaon on April 1, 2010.
10. Dr. K. R. Dayas has delivered a technical Keynote speech "Advanced applications of latest electronic devices", at inauguration of 'VIHAN-2010', the Technical Fest at Royal College of Engineering, Kunnankulam, Kerala, 7th December, 2010.
11. Dr. K. R. Dayas has delivered key-note address "What the society demands from the engineers- a materialistic view" at launching of activities of the student Chapter of Indian Society for Technical Education (ISTE) at Government Engineering College, Thrissur, Kerala, 15th December, 2010.
12. Dr. K. R. Dayas has delivered key-note address "Carbon chemistry: an intricate conundrum", at inauguration of Chemistry Association of St. Thomas College, Thrissur, Kerala, 10th February, 2011.
13. Dr. K. R. Dayas has been invited as a Chief Guest and delivered key-note address "The advanced techniques of crystal growth and latest applications in industries", at inauguration of XV National Seminar on Crystal Growth, held at PSN College of Engineering and Technology, Tirunelveli, Tamil Nadu, 23rd February, 2011.
14. Dr. K. R. Dayas has delivered invited talk on "Multiple incarnations of mighty carbon and Its multifarious product profile", in the second International Conference on Materials for future, ICMF-2011 held at Government Engineering College, Thrissur, Kerala, 25th February, 2011

15. Dr. K. R. Dayas has been invited as a Chief Guest and delivered key-note address “Importance of nanotechnology in the development of advanced products”, at inauguration of the National level “Faculty Development Programme on Nanotechnology”, organized by Jyothi Engineering College, Cheruthuruthy, Kerala, 24th March, 2011.
16. Dr. K. R. Dayas has delivered invited talk on “Biosensors and the processing of chip sensors for biotechnological applications”, at Kerala Agriculture University, Thrissur Kerala, 28th March, 2011.
17. Dr. N. Raghu has delivered invited talk on “Electronic Ceramic Materials for Packaging Applications” at National Workshop on Electronic Packaging, VIT, Vellore, 9-10 December, 2010.
18. Dr. R. Ratheesh has delivered a lecture on “Materials for Wireless Communication Applications” at Department of Electronics, Government Engineering College, Thrissur, 6th October, 2010.
19. Dr. R. Ratheesh has delivered invited talk on “Recent Trends in Wireless Communications” at Government Engineering College, Mananthavady, Kerala, 4th February, 2011.
20. Dr. T. L. Prakash has delivered key note lecture on “Nanocomposites for Electronics” in the Nanotechnology conference held at Department of Physics, Kakatiya university, Warangal. 6th November, 2010
21. Dr. N. R. Munirathnam has delivered invited talk on “Impact of RoHS on EEE industry and the importance of component and system level compliance” in a conference organized by TUV-Rheinland, Public Private Partnership (PPP) project initiated with local electronic industry on Hazardous Substance Process Management (HSPM), 22nd February, 2011.
22. Dr V. N. Mani has delivered invited talk at National Symposium on Materials for Advanced Technology (NSMAT-2011),; Banasthali University, Rajasthan, 27-29 March, 2011.
23. Dr V. N. Mani has delivered invited talk during IInd National Conference on Advanced Materials, PSN College, Tirunelveli, 25-27, August, 2010.
24. Dr. M. Kulkarni has delivered invited talk on “Polymer Nanocomposites: Synthesis and Applications”, in National Seminar on “Nano science” at M.D. Arts, B. W. Commerce & Science College, Sinnar, Dist Nashik, during 21-23 January 2010.

v) AWARDS AND HONOURS

1. New method of synthesizing crystalline BST nanoparticles and study of their dielectric properties, N. C. Pramanik, P. A. Abraham, and N. Rani Panicker, International Workshop & Symposium on Synthesis and Characterization of Glass/Glass-ceramics (IWSSCGGC-2010) Pune, 7-10 July, 2010. “Received Best Poster award”
2. Preparation of carbon aerogels and studies on the role of catalyst concentration in tuning the electrical properties of aerogel supercapacitors, R. Rakhikrishna, P. Hareesh, P A Abrham, Rani Panicker N, K. Stanly Jacob, & N C Pramanik, National Conference on Nano Structured Materials and Nanocomposites (NCNM 2010) Ottapalam, Kerala, 17- 18 March, 2011. “Received Best Presentation award”
3. Solvent extraction of Hafnium, Raghu C. Reddy, Arbind Kumar, T. L. Prakash; 48th National Metallurgist Day, organized by Indian Institute of Metals (NMD-ATM 2010), IISc., Bangalore, 14-16 November 2010. “Received First Prize for Oral Presentation”
4. Comparison of separation of impurities by dynamic vacuum distillation in 3N pure cadmium with and without oxide layer on its melt, N.R.Munirathnam, K. Srinivasa Rao, T. L. Prakash, Emerging Trends in Separation Science and Technology (SESTEC – 2010), IGCAR, Kalpakam. “Received Best Paper Prize”

5. In-situ preparation and characterization of gold nanoparticles in recycled polystyrene (Re-PS) matrix, Shrreya Krishnamurthy, Prachi Telang, P. V. Adhyapak, U. P. Mulik, D. P. Amalnerkar, Raman Memorial Conference, Department of Physics, University of Pune, 25-26 February (2011) “Received Best Poster Award”.
6. Emerald Literati Network- Awards for Excellence 2010 – Highly Commended Award for the paper entitled “Ruthenium dioxide doped manganite-based NTC thermistors for low resistance applications”, by Shweta Jagtap, Sunit Rane, Suresh Gosavi, Dinesh Amalnerkar, Microelectronics International, 26, 2 (2009) 19.

PLANS AND PROSPECTS

During the year, C-MET implemented the projects in accordance with its approach and strategy. The key features of the adopted strategy are:

1. To enhance the competency in advanced areas of science and technology to keep pace with the world scenario of electronic materials through in-house and grant-in-aid projects with inter and intra laboratory involvement.
2. Continue the interactive/ working relation with strategic sector for development of critical materials through the sponsored projects.
3. Continue the technical services and materials characterization services to industries for creating more scope for consultancy projects and improvement in cash earnings
4. Materialize international collaboration by working in the frontier area in science and technology and also seek international funding by partnering with overseas team.
5. Be a front runner in R&D of Electronics materials.

ACKNOWLEDGMENT

Centre for Materials for Electronics Technology (C-MET) is grateful to the Department of Information Technology, Ministry of Communications and Information Technology, Government of India for its whole-hearted support and guidance during the entire year. It is my pleasure to acknowledge the support to C-MET in the form of specific sponsored projects for the technology/product development from the government organizations such as VSSC (ISRO), DST, MNRE, DRDO, DAE (BRNS) and NPMASS etc.

The guidance and proactive support of the Chairman, Vice-Chairman and Members of the Governing Council of C-MET has been invaluable for effective functioning. The advice of the Steering and Executive Committee of C-MET in carrying out the programmes effectively and efficiently requires special mention. I sincerely thank the Chairman, Vice-Chairman and Members of the Governing Council, Chairman and Members of the Steering Committee as well as Members of the Executive Committee.

I place on record very special thanks to all the Officers and Staff members of Materials and Component Division, Finance Division, Autonomous Bodies Coordination Division and the other divisions of the Department of Information Technology, for their precious support and kind co-operation for implementing C-MET's programs. I am also thankful to our bankers, Bank of India, Punjab National Bank and Canara Bank at Pune as well as their branches at other places for rendering timely services. It is our pleasure to have worked with Statutory Auditors M/s P. N. Phadke & Co., Chartered Accountants & M/s Patki & Soman, Internal Auditors and I acknowledge their meticulous work.

I earnestly thank all the staff members of C-MET for their dedicated professional efforts in the R & D activities and administrative services in achieving the overall progress of C-MET during the year.

Dr. D. P. Amalnerkar
Executive Director
On behalf of C-MET Team

Major Characterisation Equipments Available at C-MET, Pune

Name of The Equipment	Name of The Manufacturer	Applications
Atomic Absorption Spectrophotometer (AAS)	Electronic Corporation (I) Ltd, Hyderabad, India	Trace Impurities Analysis
Inductively Coupled Plasma Optical Emission Spectrophotometer (ICP-OES)	Perkin Elmer, USA (Model No. Perkin Elmer P-1000)	Trace Elemental Analysis
Gas Chromatograph (GC)	Hewlett Packard, USA, (Model No. HP 5890)	Chromatographic Analysis
UV-VIS Spectrometer	Hitachi, Japan	Spectroscopic Chemical Analysis
Spectrofluorometer	Hitachi, Japan	Luminescence studies of organic, inorganic and polymeric compounds
Elemental Analyser	CE Instruments, Italy, (Model No. CE Instrument EA 1110)	Elemental Analysis of Organic/Polymeric Compounds
Potentiostat/ Galvanostat	Autolab, Netherlands	Electrochemical Synthesis and Characterization
TGA/SDTA/ DSC/DPA	Mettler Switzerland, (Model No. – Toledo 821, 851)	Thermal Characterization of Organic, Inorganic and polymeric samples
TMA/DMA	Perkin Elmer, USA, (Model No. Perkin Elmer 7e)	Thermomechanical Analysis of Polymers
Fourier Transform Infrared Spectrometer (FTIR)	Perkin Elmer, USA, (Model No. PE Spectrum 2000)	Spectroscopic Chemical Analysis
High Performance Liquid Chromatograph (HPLC) / Gel Permeation Chromatograph (GPC)	Water, Austria, (Model No. HPLC 515/996 & GPC 2410)	Chromatographic Analysis of Polymeric and Organic Compounds
Scanning Electron Microscope (SEM) with EDAX	Philips, Netherlands, (Model No. Philips XL-30)	Surface Morphology and related Microanalysis
Graphite Furnace Atomic Absorption Spectrometer	Nulab, (Model No. Avanta – sigma)	Trace Impurity Analysis
Hot Stage Microscope	Mettler- Toledo (Model No. FP-900) Lica DMLP	Characterisation of Liquid Crystalline Polymers
Scanning Probe Microscope	Agilent Technologies Inc.	Examination of Topological Features at Atomic Scale
Field Emission Scanning Electron Microscope	Hitachi (Model No. 4800 II)	Surface Morphology and related Microanalysis

Major Characterisation Equipments Available at C-MET, Hyderabad

Name of The Equipment	Model	Name of The Manufacturer	Applications
Inductively Coupled Plasma Mass Spectrometer (ICP-MS)	X-Series II	Thermo Fisher Scientific, Germany	Elemental analysis in liquid (ppb/ppt level)
Gas Chromatograph Mass Spectrometer (GC-MS)	DSQ II	Thermo Fisher Scientific, USA	Analysis of PBB and PBDE in electronic materials
Glow Discharge – Optical Emission Spectrometer (GD-OES)	Model No. JY-10000RF	JOBIN-YVON, France	Elemental, Gases and depth Profile analysis in Solids (ppm/ppb Level)
Energy Dispersive X-ray Fluorescence (ED XRF)	ARL Quanta X	Thermo Fisher Scientific, USA	Screening of elemental analysis down to ppm level
Ion Chromatography (IC)	850 IC Professional	Metrohm, Switzerland	Estimation of Anions / Cations
Graphite Furnace Atomic Absorption spectroscopy (GF AAS)	GF3000 / 932AA	GBC, Australia	Elemental analysis at ppm / ppb level in liquids
Microwave Digestion System	Multiwave-3000	Anton Paar, Vienna	Closed Digestion of samples by Microwave
Particle Size Analyzer	Microtrac X100	Honeywell, USA	Analysis of particle size distribution
Water Purification System	Purelab Classic	ELGA, U.K.	18.2 MΩ water for analysis
Metallurgical Microscope	LABORLUX 12 ME ST	LEICA, Germany	Morphological and Structural Analysis of Materials
Oxygen-Nitrogen Analyzer	TC 236	LECO, USA	Estimation of Oxygen, Nitrogen in Metal Samples
Micro Hardness Tester	HMV	SHIMADZU, Japan	Measuring Brinell Rockwell, Diamond Hardness
Microwave Sintering Furnace	ENERZI	Microwave Systems, India	Sintering of materials by microwaves
UV Visible Spectrophotometer	UV 2450	SHIMADZU, Japan	Organic & Inorganic Analysis of Elements in liquids (micro level)

Major Characterisation Equipments Available at C-MET, Thrissur

Name of The Equipment	Name of The Manufacturer	Applications
X-ray Fluorescence Spectrometer	Philips (Model No. PW2400)	Elemental analysis quantitative and qualitative estimation
DSC/TGA	TA Instruments, USA, Model SDTQ600	To study physicochemical changes with respect to temperature upto 1500°C
Impedance Analyser	Hewlett-Packard, (HP4192A), Japan	To measure inductance, capacitance, resistance, factor and variation of these properties with frequency from 5Hz to 13 MHz.
X-ray Diffractometer with Variable Temperature Attachment	Bruker, Germany, Model No.: D5005)	Phase evaluation, crystal structural studies, phase formation with respect to temperature
Mercury Porosimeter	CE Instruments, Italy	Pore structure analysis with respect to pore volume, pore radius, pore size distribution in green and sintered bodies.
BET Surface Area Analyser	Quantachrome Nova 1200, USA	Measurements of surface area of nano powders
Supercapacitor Test Systems	Arbin Instruments, USA, BT-2000	Measurement of capacitance, ESR, charge-discharge cycle
Gain Phase Analyser	Agilent Technologies, USA, Model 4294A	For impedance analysis of materials in the frequency range 40hz to 110MHz
Electrometer	Keithley, USA, Model 6517A	Measurement of electrical resistivity (100 to 210TO) voltage/current, RH, etc.
Vector Network Analyzer	Agilent Technologies E8263 B Model, USA	Microwave characterization of Dielectric Resonators, Composite substrates, ferrites, tunable dielectrics etc.
Piezo Evaluation System	Aix ACCT (FE 2000), Germany	For piezoelectric property evaluation
Thermo Mechanical Analyzer	TMA/SS6100, SII, Japan	Measurement of thermal expansion coefficient of materials
UV-Visible Spectrophotometer	Lambda 35, Perkin Elmer	For measuring the absorbance in the UV-Visible region



C-MET, PUNE

**AUDITED
FINANCIAL STATEMENTS
FOR THE YEAR
2010-2011**

M/s P. N. PHADKE & COMPANY
CHARTERED ACCOUNTANTS
103, MEGH APTS, S. No. 39/33,
Opp. Ayurvedic Ras-shala,
Off Karve Road, Pune – 411 004.
Ph.: 020-25464243, 25462236.

AUDITORS' REPORT

We have audited the attached *Balance Sheet* of *Centre for Materials for Electronics Technology (C-MET)* as on 31st of March 2011 and the *Income and Expenditure Account* as on that date annexed thereto. These financial Statements are the responsibility of the management of *Centre for Materials for Electronics Technology (C-MET)*. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with auditing standards generally accepted in India. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence, supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by the management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

1. We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purposes of our audit;
2. In our opinion, proper books of account, as required by law have been kept by the Society so far as appears from our examination of those books;
3. The Balance Sheet and Income & Expenditure Account dealt with by this report are in agreement with the books of account;
4. In our opinion, the Balance Sheet and the Income & Expenditure Account dealt with by this report comply with the accounting standards to the extent applicable to the Society, subject to the comments in 'Notes to Accounts' and 'Significant Accounting Policies'.
5. In our opinion, and to the best of our information and according to explanations given to us and subject to Annexure attached herewith read with the notes contained in Schedule 5 & 6 the accounts give a true and fair view in conformity with the accounting principle generally accepted in India :
 - a) In the case of the *Balance Sheet*, of the state of affairs of the *Centre for Materials for Electronic Technology (C-MET)* as at 31st March, 2011, and;
 - b) In the case of *Income & Expenditure*, of the *Surplus of the Centre for Materials for Electronic Technology (C-MET)* for the year ended on that date.

For **P. N. Phadke & Co.**,
Chartered Accountants,

Sd/-

CA V. P. Phadke, M. No. 100811
(Partner)

Pune – 411 004.
Dated: 12th September, 2011

ANNEXURE
Forming part of the Audit Report
of Centre for Materials for Electronics Technology
for the Year ended 31st March 2011.

1) Fixed Assets pertaining to projects:

At present, the fixed assets pertaining to projects are shown in the books as project expenses. We suggest that such assets should be reflected as project assets separately in the Balance Sheet.

In respect of those assets, which relate to the projects that are completed & the fixed assets which are not to be returned to the sponsorers, proper decision should be taken either to dispose off such assets off or reflect them separately in our financial statements.

2) Valuation of Inventory:

Pursuant to the management policy with regard to valuation of lab-wares, chemicals and consumables, the purchases are charged to consumption irrespective of stock thereof at the end of the year. We are of the opinion that the stock at the end of the year needs to be valued and brought in to account.

3) Capital Work –in – progress:

This accounts shows ₹ 52,58,000/- debit balance during the current year. (Previous Year of ₹ 52,58,000/-).

4) Prior period income and expenditure:

Expenses for ₹ 51,300/- of previous year have been accounted for in the current year.

5) Contingent liability:

Contingent liability not provided for in the books of account

	₹ in Lacs	
	Current Year	Previous year
For Capital goods	Nil	Nil
For Others	00.82	00.82
For Income Tax	Nil	Nil

For **P. N. Phadke & Co.,**
Chartered Accountants,

Sd/-

CA V. P. Phadke, M. No. 100811
(Partner)

Pune – 411 004.

Dated: 12th September, 2011

Centre for Materials for Electronics Technology, Pune

BALANCE SHEET AS AT 31st MARCH, 2011

(Amount ₹)

CORPUS / CAPITAL FUND AND LIABILITIES :	Schedule	As at 31.3.2011	As at 31.3.2010
CORPUS / CAPITAL FUND	1	26,97,62,357	17,84,37,392
CURRENT LIABILITIES AND PROVISIONS (Including sponsored project)	2	34,27,06,701	26,13,48,046
TOTAL		61,24,69,058	43,97,85,438
ASSETS :			
FIXED ASSETS	3	8,18,31,445	8,83,72,955
CURRENT ASSETS, LOANS AND ADVANCES	4	53,06,37,613	35,14,12,483
MISCELLANEOUS EXPENDITURE (to the extent not written off or adjusted)			
TOTAL		61,24,69,058	43,97,85,438
SIGNIFICANT ACCOUNTING POLICIES	5		
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS	6		

We hereby certify the above balance sheet to be true & correct to the best of our knowledge & belief, subject to notes on accounts and schedules attached hereto.

Sd/-

Dr. D. P. Amalnerkar
Executive Director

Sd/-

Sh. G. B. Rao
Finance In-charge

As per our report of even date attached.
for M/s P. N. PHADKE & Co.
CHARTERED ACCOUNTANTS

Sd/-

CA V. P. Phadke, M. No. 100811
(PARTNER)

Pune – 411 004.

Dated: 12th September, 2011

Centre for Materials for Electronics Technology, Pune.

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st MARCH, 2011

(Amount ₹)

INCOME :	Schedule	Current Year 2010 - 2011	Previous Year 2009 - 2010
Revenue Grants	7	15,11,79,374	7,36,16,223
Income from Services	8	74,38,003	1,99,76,431
Interest Earned	9	2,31,71,488	1,36,37,576
Other Income	10	7,27,505	5,12,456
TOTAL (A)		18,25,16,370	10,77,42,686
EXPENDITURE :			
Establishment Expenses	11	6,45,46,020	7,18,60,653
Laboratory and Administrative Expenses etc.	12	2,01,18,487	1,90,53,869
Depreciation		1,13,47,524	1,26,17,957
TOTAL (B)		9,60,12,031	10,35,32,479
Surplus / (Deficit) for the year (A - B)		8,65,04,339	42,10,207
Balance transferred to / from Corpus/Capital Fund		8,65,04,339	42,10,207
SIGNIFICANT ACCOUNTING POLICIES	5		
CONTINGENT LIABILITIES & NOTES ON ACCOUNTS	6		

We hereby certify the above Income & Expenditure account to be true & correct to the best of our knowledge & belief, subject to notes on accounts and schedules attached hereto.

Sd/-
Dr. D. P. Amalnerkar
Executive Director

Sd/-
Sh. G. B. Rao
Finance In-charge

As per our report of even date attached.
for M/s P. N. PHADKE & Co.
CHARTERED ACCOUNTANTS

Sd/-
CA V. P. Phadke, M. No. 100811
(PARTNER)

Pune – 411 004.
Dated: 12th September, 2011

Centre for Materials for Electronics Technology, Pune

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2011

(Amount ₹)

SCHEDULE 1 - CORPUS / CAPITAL FUND :	As at 31.3.2011		As at 31.3.2010	
Balance as at the beginning of the year	24,79,49,493		24,05,65,716	
Add: Contribution towards Corpus/Capital Fund	48,20,626		73,83,777	
	25,27,70,119		24,79,49,493	
Add / (Less) : Balance of net income / Expenditure transferred from Income and Expenditure Account :				
As per last Account	(6,95,12,101)		(7,37,22,308)	
Add : Surplus / (Deficit) for the year	8,65,04,339		42,10,207	
	1,69,92,238	26,97,62,357	(6,95,12,101)	17,84,37,392
BALANCE AT THE YEAR END		26,97,62,357		17,84,37,392

SCHEDULE 2 - CURRENT LIABILITIES AND PROVISIONS : (Schedules forming part of Balance Sheet as at 31st March, 2011)

A. CURRENT LIABILITIES :	As at 31.3.2011		As at 31.3.2010	
1. Sundry Creditors :				
a) For goods	----		1,63,042	
b) For E.M.D and Deposits	20,09,755	20,09,755	11,59,500	13,22,542
2. Statutory Liabilities :				
Profession Tax / ITDS / Service Tax / GIS		5,137		5,389
3. Other current Liabilities :				
Sponsored Projects	29,97,30,857		22,21,07,615	
Others Liabilities	45,836	29,97,76,693	2,88,837	22,23,96,452
TOTAL (A)		30,17,91,585		22,37,24,383
B. PROVISIONS :				
1. Gratuity Payable	2,24,62,647		1,94,39,729	
2. Leave Encashment payable	1,71,31,731		1,57,07,916	
3. Expenses Payable	13,20,738	4,09,15,116	24,76,018	3,76,23,663
TOTAL (B)		4,09,15,116		3,76,23,663
TOTAL (A + B)		34,27,06,701		26,13,48,046

Centre for Materials for Electronics Technology, Pune

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2011

SCHEDULE 3 - Fixed Assets : (Amount ₹)

DESCRIPTION	GROSS BLOCK			DEPRECIATION			NET BLOCK			
	As at 1.4.2010	Additions during the year	Deletions/ Adj. during the year	As at 31.03.2011	As at the beginning of the year	For the year	Deletions/ Adj. during the year	Total upto 31.03.2011	AS AT 31.03.2011	As at 31.3.2010
A. FIXED ASSETS :										
1. BUILDINGS:										
a) On Freehold Land	6,55,95,676	13,32,355	-	6,69,28,031	3,59,77,431	30,28,443	-	3,90,05,874	2,79,22,157	2,96,18,245
2. LAB EQUIPMENT	18,73,29,208	6,58,000	-	18,79,87,208	14,19,10,080	68,62,220	-	14,87,72,300	3,92,14,908	4,54,19,128
3. FURNITURE, FIXTURES	1,05,26,766	2,82,282	-	1,08,09,048	62,63,712	4,45,935	-	67,09,647	40,99,401	42,63,054
4. OFFICE EQUIPMENT	1,09,86,612	4,66,335	-	1,14,52,947	90,77,229	3,27,478	-	94,04,707	20,48,240	19,09,383
5. COMPUTER / PERIPHERALS	49,00,082	4,15,118	14,612	53,00,588	45,23,621	3,58,986	-	48,82,607	4,17,981	3,76,461
6. ELECTRIC FITTINGS	7,05,257	3,74,669	-	10,79,926	1,40,316	75,227	-	2,15,543	8,64,383	5,64,941
7. ELECTRIC SUBSTATION	23,99,566	11,60,667	-	35,60,233	16,46,720	1,99,977	-	18,46,697	17,13,536	7,52,846
8. AIR CONDITIONERS	5,32,723	1,31,200	-	6,63,923	3,62,966	45,144	-	4,08,110	2,55,813	1,69,757
9. TUBEWELL	73,255	-	-	73,255	32,115	4,114	-	36,229	37,026	41,140
TOTAL	28,30,49,145	48,20,626	14,612	28,78,55,159	19,99,34,190	1,13,47,524	-	21,12,81,714	7,65,73,445	8,31,14,955
B. CAPITAL WORK-IN-PROGRESS	52,58,000	-	-	52,58,000	-	-	-	-	52,58,000	52,58,000
TOTAL OF CURRENT YEAR	28,83,07,145	48,20,626	14,612	29,31,13,159	19,99,34,190	1,13,47,524	-	21,12,81,714	8,18,31,445	8,83,72,955

Centre for Materials for Electronics Technology, Pune

SCHEDULE 4 - CURRENT ASSETS, LOANS & ADVANCES : (Schedules forming part of Balance Sheet as at 31st MARCH, 2011)

(Amount ₹)

	As at 31.3.2011		As at 31.3.2010	
A. CURRENT ASSETS:				
1. Cash balances in hand		17,080		25,452
2. Bank Balances with Scheduled Banks :				
- On Deposit Accounts	24,68,39,177		8,00,00,000	
- On Savings Accounts	7,89,39,084		87,72,410	
- Project Deposits	17,17,12,334	49,74,90,595	23,46,07,659	32,33,80,069
TOTAL (A)		49,75,07,675		32,34,05,521
B. LOANS, ADVANCES AND OTHER ASSETS				
Loans and Advances to Staff	4,63,507		1,42,909	
Loans and Advances to Others	1,21,57,884		43,55,772	
Amount Recoverable	14,02,075		17,97,597	
Advance to Suppliers	52,66,765		45,32,591	
Security and Other Deposits	86,38,831		1,19,39,735	
Prepaid Expenses	25,141		50,208	
Interest Accrued on FDRs	51,75,735	3,31,29,938	51,88,150	2,80,06,962
TOTAL (B)		3,31,29,938		2,80,06,962
TOTAL (A + B)		53,06,37,613		35,14,12,483

CENTRE FOR MATERIALS FOR ELECTRONICS TECHNOLOGY (C-MET)

Schedules forming part of the Accounts for the year ended 31st March 2011.

SCHEDULE : 5 SIGNIFICANT ACCOUNTING POLICIES

1. Accounting Conventions :

The Financial Statements are prepared on the basis of historical cost conventions and on the basis of going concern, accrual and consistently followed, except for Bonus, which is accounted for on cash basis.

2. Revenue Recognition :

- Income from operation comprises, Income from analysis receipts and Professional /consultancy services. Income from these activities is accounted for as and when services are rendered.
- Grants are recognized when there is a reasonable assurance that, the grants will be received.
- C-MET being research body its entire expenditure relates to *research activity*. The expenditure incurred is debited to the appropriate accounts.
- All significant items of incomes and expenses are accounted on accrual basis unless otherwise stated.

3. Fixed Assets :

- Fixed Assets stated in the Balance Sheet are valued at their cost of acquisition inclusive of freight, octroi and other direct and indirect cost in respect thereof.
- Society has been directed to charge depreciation on its assets on the written down value basis vide instructions issued by Ministry of Information Technology. Accordingly depreciation has been charged as per rates prescribed under the Income Tax Act, 1961.

4. Inventory :

As per the policy consistently followed by the Centre, expenditure incurred on consumable stores and spares is charged to revenue account.

5. Foreign Currency Transaction :

Transactions in foreign currency are recorded at the exchange rates prevailing on the date of transactions.

Foreign Currency Assets / Liabilities are restated at the rates prevailing at the year-end.

Exchange Differences relating to fixed assets are adjusted to the cost of the assets.

Any other exchange difference is dealt with in the Income & Expenditure Account.

6. Prior Period and Extraordinary Items :

Prior period income & expenses and extraordinary items, wherever material are disclosed separately. Prior period items include material items of Income or Expenses which arise in the current period as a result of error or omission in the preparation of financial statements of one or more periods. It does not include items, which are ascertained and determined during the year.

7. Retirement Benefits :

C- MET has set up Contributory Provident Fund separately. Leave Encashment and Gratuity is accounted for as per the actuarial valuation, liability whereof is as below :

a) **Gratuity** ₹ 2,24,62,647/- (Previous year ₹ 1,94,39,729/-)

b) **Leave Encashment-** ₹ 1,71,31,731/- (Previous year ₹ 1,57,07,916/-)

8. Amount equal to capital expenditure is credited to capital fund. Grants for sponsored projects are shown separately. Unspent amount of the sponsored projects is shown as liability.

For CENTRE FOR MATERIALS FOR ELECTRONICS TECHNOLOGY

Sd/-

Dr. D. P. Amalnerkar
Executive Director

Sd/-

G. B. Rao
Finance In-charge

For P. N. Phadke & Co.
Chartered Accountants,

Sd/-

CA V. P. Phadke, M. No. 100811
(Partner)

Pune – 411 004.

Dated: 12th September, 2011

Centre for Materials for Electronics Technology (C-MET)

Schedules forming part of the Accounts for the year ended 31st March 2011

SCHEDULE : 6 NOTES ON ACCOUNTS

1. Current Assets, Loans & Advances : In the opinion of the management, the current assets, loans and advances have a value on realization in the ordinary course of business equal at least to the aggregate amount shown in the Balance Sheet.
2. Foreign Currency Transactions :
 - a) Value of Imports (FOB basis) :

Capital Goods : ₹ 76,11,950.71 (Previous Year ₹ 5,11,98,348)
 - b) Expenditure in Foreign Currency : ₹ 32,60,556.04/- (Previous Year ₹ 60,48,512)As the information of CIF basis for import of capital goods is not available, values are taken on FOB basis.
3. The Society is approved institution in terms of sub-section (21) of section 10 of the Income Tax Act, 1961 and is exempt from tax.
4. Since most of the materials/equipments are of technical nature, their allocation between equipments, stores and projects is taken as certified by the management.
5. C-MET, being a scientific society and not a commercial, industrial or a business entity, the Management is of the opinion that reporting requirements as per AS-17 "Segment Reporting" are not mandatory.
6. The Management of C-MET is of the opinion that being a Scientific Society under Ministry of Communications and Information Technology, Govt. of India and a Societies Registration Act the disclosure requirement as per AS-18 "Related Party Disclosure" are not applicable.
7. During the year 2007-08 the Income Tax department had raised a demand of Rs. 77.66 lacs as dues for Assessment year 2005-06. The said demand has been paid in full. This amount is not yet reckoned in the books as expenses and is shown under current assets.
8. In the option of the Management, Accounting Standard 22 (AS-22) for "Accounting for taxes on income" is not applicable to the Society as it is exempt from payment of income tax.
9. Debit and Credit Balances of Personal Accounts are subject to confirmation.
10. Previous year's figures have been regrouped and rearranged wherever necessary.
11. Schedules 1 to 12 are annexed to and form an integral part of the Balance Sheet as at 31st March 2011 and the Income & Expenditure Account for the year ended on that date.

For CENTRE FOR MATERIALS FOR ELECTRONICS TECHNOLOGY

Sd/-
Dr. D. P. Amalnerkar
Executive Director

Sd/-
G. B. Rao
Finance In-charge

For P. N. Phadke & Co.
Chartered Accountants,

Sd/-
CA V. P. Phadke, M. No. 100811
(Partner)

Pune – 411 004.
Dated: 12th September, 2011

Centre for Materials for Electronics Technology, Pune

Schedules forming part of Income & Expenditure A/c for the year ended 31st MARCH, 2011

(Amount ₹)

SCHEDULE 7 - REVENUE GRANTS :	Current Year 2010-11	Previous Year 2009-10
Grants for Revenue Expenditure.	15,11,79,374	7,36,16,223
TOTAL	15,11,79,374	7,36,16,223
SCHEDULE 8 - INCOME FROM SERVICES :	Current Year 2010-11	Previous Year 2009-10
Income from Services:		
Analysis receipts	4,45,864	4,34,081
Overhead receipts	61,25,899	1,93,76,350
Technology Transfer	—	20,000
Professional / Consultancy Services / Intellectual Fee	8,66,240	1,46,000
TOTAL	74,38,003	1,99,76,431
SCHEDULE 9 - INTEREST EARNED :	Current Year 2010-11	Previous Year 2009-10
On Savings account and Term Deposits :		
a) With Scheduled Banks	2,30,52,446	1,35,95,279
b) On Advances to Employee	1,19,042	42,297
TOTAL	2,31,71,488	1,36,37,576
SCHEDULE 10 - OTHER INCOME :	Current Year 2010-11	Previous Year 2009-10
1. Surplus on Project Completion	3	74
2. Miscellaneous Income	7,27,502	5,12,382
TOTAL	7,27,505	5,12,456

Centre for Materials for Electronics Technology, Pune

Schedules forming part of Income & Expenditure A/c for the year ended 31st MARCH, 2011

(Amount ₹)

SCHEDULE 11 - ESTABLISHMENT EXPENSES :	Current Year 2010 -11	Previous Year 2009-10
Salaries and Allowances	4,80,72,007	5,18,79,101
Bonus	1,83,062	1,72,700
Training	9,119	-
Leave Travel Concession	14,62,516	1,83,093
Medical Reimbursement	22,61,289	21,25,621
Leave Encashment	31,72,610	30,75,383
Gratuity	39,62,891	76,31,132
Honorarium	83,000	34,200
Canteen Reimbursement	5,79,885	5,65,895
Newspaper & Periodicals	1,48,930	2,08,554
CEA Reimbursement	10,31,467	9,92,759
Membership Fees	34,452	35,183
Employer's Contribution to CPF	27,13,433	43,46,730
Interest Shortfall on CPF	3,12,987	49,481
Wages	3,37,462	4,10,280
Benevolent Fund Contribution	21,720	21,840
Recruitment Expenses	1,59,190	1,28,701
TOTAL	6,45,46,020	7,18,60,653

Schedule 12 - Laboratory And Administrative Expenses :

(Schedules Forming Part of Income & Expenditure A/c for the year ended 31st MARCH, 2011)

(Amount ₹)

Particulars	Current Year 2010-11	Previous Year 2009-10
Chemicals	-	3,276
Laboratory Consumables	-	2,71,337
Laboratory General expenses	26,310	15,018
Electricity charges	53,68,410	48,17,963
Water charges	2,50,989	2,50,989
Insurance on Equipments	41,200	-
<i>Repairs and maintenance :</i>		
On Buildings	7,33,143	15,66,068
On Electricals	2,27,748	3,66,913
On Laboratory Equipments	1,82,844	5,17,180
On Office Equipments	5,68,911	5,16,697
Rates and Taxes	9,82,497	7,78,889
Postage & Telegram Charges	1,12,110	84,069
Telephone , Telex & Fax charges	5,99,316	5,79,124
Printing and Stationary	6,16,879	7,15,405
Conveyance	5,328	9,442
Vehicle Hire	18,81,901	17,07,519
TA & DA	15,44,966	10,56,367
Security expenses	19,01,115	14,23,926
Office & General Expenses	23,50,124	17,05,946
Internet charges	2,19,317	1,17,641
Diesel for Gensets	4,06,099	3,95,197
Auditors Remuneration	95,150	68,735
Audit expenses	27,347	54,167
Meeting Expenses	10,24,010	9,92,570
Gardening expenses	5,47,332	3,57,146
Bank charges	326	150
Advertisement and Publicity	49,477	1,13,430
Professional charges	2,03,350	10,000
Prior period Expenses	51,300	11,030
Foundation Day Expenses	89,376	1,79,395
Land Development Expenses	-	3,68,280
Loss on sale of assets	11,612	-
TOTAL	2,01,18,487	1,90,53,869

Centre for Materials for Electronics Technology, Pune

DETAILS OF PROJECT BALANCES AS ON 31-3-2011

(Amount ₹)

Sr. No.	Project Name	Opening Balance as on 1.4.2010	Receipts during the year 2010-2011	Payments during the year 2010-11			Closing Balance as on 31.3.2011
				Fixed Assets	Other Expenses	Total	
1		2	3	4	5	6 = (4+5)	7 = (2+3-6)
PUNE							
1	SP14 Plasma Reactor	47,27,787	-	5,80,679	23,98,518	29,79,197	17,48,590
2	SP20 Thick Film Thermal Sensor	87,886	-	-	87,886	87,886	-
3	SP21 BRNS-Multilayer LTCC	9,67,957	7,40,000	-	11,46,475	11,46,475	5,61,482
4	SP22 TiO ₂ Phosphate Glass	(41,311)	7,27,975	13,500	7,02,317	7,15,817	(29,153)
5	SP23 Nano Structured Binary	(12,774)	2,24,000	-	1,22,142	1,22,142	89,084
6	SP24 X-ray Absorbing -DIT	15,66,016	13,29,303	8,49,216	7,56,485	16,05,701	12,89,618
7	SP25 Nano Structure Spinel Hydrogen	6,91,053	1,03,761	3150	8,57,799	8,60,949	(66,135)
8	SP26 Micro-cantilever proj.	80	-	-	-	-	80
9	SP27 Semiconductor quantum Dots	1,69,007	1,10,000	-	2,79,007	2,79,007	-
10	SP28 Solar light photocatalyst	612,654	-	2,78,693	5,45,462	8,24,155	(2,11,501)
11	SP29 Q-semiconductor Glass	90,96,747	87,625	34,18,341	8,70,104	42,88,445	48,95,927
12	SP30 LTCC Project-BARC	27	-	-	-	-	27
13	SP31 AMC and Spares for MEMS	12,11,722	-	-	11,28,902	11,28,902	82,820
14	SP32 Adv. Process capabilities in LTCC	4,28,11,946	-	46,476	8,93,421	9,39,897	4,18,72,049
15	SP33 Devp. Of LTCC Sys for Cryocooler Appl.	-	8,88,000	-	1,61,557	1,61,557	7,26,443
16	SP34 Hybrid Solar Cells (DIT)	-	77,00,000	1,21,490	10,08,294	11,29,784	65,70,216
17	SP35 Devp. of Green Piezoresistive Pastes	-	36,79,000	-	2,47,795	2,47,795	34,31,205
18	TS04 Scaleup of colour Glass	2,23,437	-	-	-	-	2,23,437
19	TS06 SAC	1,91,201	-	-	68,239	68,239	1,22,962
20	TS07 LTCC Package for MEMS-JCDA	12,43,435	11,04,081	4,89,006	9,02,488	13,91,494	9,56,022



Centre for Materials for Electronics Technology, Pune

DETAILS OF PROJECT BALANCES AS ON 31-3-2011

(Amount ₹)

Sr. No.	Project Name	Opening Balance as on 1.4.2010	Receipts during the year 2010-2011	Payments during the year 2010-11			Closing Balance as on 31.3.2011
				Fixed Assets	Other Expenses	Total	
1		2	3	4	5	6 = (4+5)	7 = (2+3-6)
21	TS08 Fabrication of LTCC	5,65,781	9,307	-	5,75,088	5,75,088	-
22	TS09 LTCC Packages thin film devices	26,85,782	75,58,300	5,34,479	22,09,173	27,43,652	75,00,430
23	TS10 Devp. Of Microwave Components in LTCC	-	2,70,015	-	1,16,155	1,16,155	1,53,860
24	TS11 Study on Synthesis of nano	-	6,00,000	-	86,926	86,926	5,13,074
	TOTAL (a)	6,67,98,433	2,51,31,367	63,35,030	1,51,64,233	2,14,99,263	7,04,30,537
HYDERABAD							
25	SP16 Studies on the Synthesis and phase..	(48,836)	2,98,836	-	2,22,206	2,22,206	27,794
26	SP17 Microwave sintering of Refractory metal...	48,411	-	-	48,411	48,411	-
27	SP18 RoHS	31,19,329	1,87,95,000	1,31,102	28,60,398	29,91,500	1,89,22,829
28	SP20 Design & Devp. Of controlled melting..	5,25,716	-	-	2,73,891	2,73,891	2,51,825
29	SP21 Ultrahigh quality Silicon carbide.. for adv. Electronics devices	6,38,57,308	-	15,46,218	1,96,433	17,42,651	6,21,14,657
30	SP22 Establishment of extended pilot plan...annum hafnium sponge	4,42,95,268	6,00,00,000	1,37,58,622	22,99,555	1,60,58,177	8,82,37,091
31	SP23 Indo-Bulgarian joint research-R&D....through EBM	1,35,955	-	-	19,032	19,032	1,16,923
32	SP24 PCB	-	78,70,000	-	2,45,664	2,45,664	76,24,336
33	SP25 Gallium - DST	-	9,80,058	-	1,35,028	1,35,028	845,030
	TOTAL (b)	11,19,33,151	8,79,43,894	1,54,35,942	63,00,618	2,17,36,560	17,81,40,485

Centre for Materials for Electronics Technology, Pune

DETAILS OF PROJECT BALANCES AS ON 31-3-2011

(Amount ₹)

Sr. No.	Project Name	Opening Balance as on 1.4.2010	Receipts during the year 2010-2011	Payments during the year 2010-11			Closing Balance as on 31.3.2011
				Fixed Assets	Other Expenses	Total	
1		2	3	4	5	6=(4+5)	7=(2+3-6)
	THRISSUR						
34	SP17 Devp. Of Ferroelectric	(22,257)	22,257	-	-	-	-
35	SP21 Nano PZE-4	49,205	-	-	49,205	49,205	-
36	TS23 PZT FT Actuators	12,786	-	-	12,786	12,786	-
37	TS25 Pyrolysis of Silica	7,115	-	-	7,115	7,115	-
38	SP26 Microwave Amplifiers	13,83,913	2,85,000	13,23,705	3,45,208	16,68,913	-
39	SP27 Synthesis of Nano Mtrls	67,85,455	89,85,000	78,51,576	50,16,943	1,28,68,519	29,01,936
40	SP28 Piezo Micro Actuator	(2,09,990)	2,09,990	-	-	-	-
41	SP29 Pilot plant ..crystalite	16,84,835	14,40,000	5,69,513	12,25,674	17,95,187	13,29,648
42	TS30 Microwave Amplifiers	1,07,91,256	27,92,000	6,58,873	64,45,182	71,04,055	64,79,201
43	SP31 P.E.thinfiln for Actuator	5,30,318	-	1,91,639	2,35,347	4,26,986	1,03,332
44	SP32 P.E.Biomorph Mirror	19,98,470	4,44,000	16,82,588	7,60,085	24,42,673	(203)
45	SP33 Transparent oxides	9,86,935	5,49,000	11,42,626	2,60,010	14,02,636	1,33,299
46	SP34 Super capacitor	7,28,327	4,39,000	4,31,066	3,94,832	8,25,989	3,41,429
47	SP35 Carbon Aerogel	1,46,49,663	-	19,37,091	7,13,394	26,50,485	1,19,99,178
48	SP36 Piezo Ceramic ML Actuat	40,00,000	-	-	8,46,272	8,46,272	31,53,728
49	SP37 Devp. of Carbon Aerogel	-	1,05,85,000	4,47,475	16,34,395	20,81,870	85,03,130
50	SP38 Devp. of ML Actuator	-	82,59,000	2,62,181	13,84,567	16,46,748	66,12,252
51	SP39 Devp. of Light Polymer	-	12,50,000	-	1,63,095	1,63,095	10,86,905
52	SP40 Devp. of nano PZT	-	93,68,000	-	8,52,000	8,52,000	85,16,000
	TOTAL (c)	4,33,76,031	4,46,28,247	1,64,98,333	2,03,46,110	3,68,44,443	5,11,59,835
	GRAND TOTAL (a+b+c)	22,21,07,615	15,77,03,508	3,82,69,305	4,18,10,961	8,00,80,266	29,97,30,857

Centre for Materials for Electronics Technology, Pune

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31st MARCH, 2011

(Amount ₹)

RECEIPTS	Current Year 2010-11	Previous Year 2009-10	PAYMENTS	Current Year 2010-11	Previous Year 2009-10
<u>I. Opening Balances</u>			<u>I. Payments</u>		
a) Cash in Hand	25,452	23,201	Establishment Expenses	6,04,48,159	6,24,51,341
b) Bank Balances :			Administrative Expenses	2,07,83,580	1,80,95,030
i) Savings accounts	3,40,30,940	5,29,36,595	<u>II. Project Payments</u>		
ii) In Fixed Deposits	28,93,49,129	11,09,97,418	Sponsored Projects	5,19,32,294	9,46,40,596
<u>II. Grants Received</u>			<u>III. Fixed Assets</u>		
a) From D.I.T, G.o.I			Purchase of Fixed Assets	48,20,626	70,95,377
Capital Grants	48,20,626	73,83,777			
Revenue Grants	15,11,79,374	7,36,16,223	<u>IV. Other Payments</u>		
<u>III. Interest On deposits</u>			Loans & Advances from staff & others	1,19,74,822	2,38,11,269
On Bank deposits	2,29,24,891	77,02,508	<u>V. Closing Balances</u>		
<u>IV. Other Income</u>			a) Cash in Hand	17,080	25,452
Analysis Income	3,50,228	4,37,283	b) Bank Balances :		
Miscellaneous receipts	1,20,95,467	2,51,68,868	i) Savings accounts	19,96,30,132	3,40,30,940
<u>V. Other Receipts</u>			ii) In Fixed Deposits	29,78,60,463	28,93,49,129
Sponsored Project receipts	12,92,69,921	22,17,47,012			
Loans & Advances from staff & others	34,21,128	2,94,86,249			
TOTAL	64,74,67,156	52,94,99,134	TOTAL	64,74,67,156	52,94,99,134

**Statement showing comments of the Statutory Auditors on the accounts of
C-MET for the year 2010-2011 and C-MET's replies thereto**

Sr.	Brief Subject	Auditor's Comments	C-MET Reply												
1.	Fixed Assets pertaining to projects :	<p>At present, the fixed assets pertaining to projects are shown in the books as project expenses. We suggest that such assets should be reflected as project assets separately in the Balance Sheet.</p> <p>In respect of those assets, which relate to the projects that are completed & the fixed assets which are not to be returned to the sponsors, proper decision should be taken either to dispose off such assets or reflect them separately in our financial statements.</p>	<p>Actual amount of Fixed Assets procured out of the Projects is separately indicated in the schedule. Also individual headwise expenditure is separately maintained and sent to Sponsoring Agency. In addition, project Fixed Assets register is also maintained.</p> <p>Fixed Assets pertaining to completed projects are disposed off as soon as sponsoring agency consents their disposal.</p>												
2.	Valuation of Inventory :	Pursuant to the management policy with regard to valuation of lab-wares, chemicals and consumables, the purchases are charged to consumption irrespective of stock thereof at the end of the year. We are of the opinion that the stock at the end of the year needs to be valued and brought into account.	Consumable materials like lab wares, chemicals etc. are purchased according to actual need and immediately sent to the respective lab. for use. Hence there is no retaining store system. Therefore, valuation of consumable stores by the storekeeper is not feasible												
3.	Capital Work - in - progress :	This accounts shows ₹ 52,58,000/- debit balance during the current year. (Previous Year ₹ 52,58,000/-).	₹ 52,58,000/- is outstanding at Pune laboratory. Since the e-governance project is underway, adjustment entry will be passed upon completion as soon as final statement is received from NIC.												
4.	Prior period income and expenditure:	Expenses for ₹ 51,300/- previous year have been accounted for in the current year.	For information only.												
5.	Contingent Liability :	<p>Contingent liability not provided for in the books of account :-</p> <p align="right">₹ in Lacs</p> <table border="1"> <thead> <tr> <th></th> <th>Current Year</th> <th>Previous Year</th> </tr> </thead> <tbody> <tr> <td>For Capital goods</td> <td>Nil</td> <td>Nil</td> </tr> <tr> <td>For Others</td> <td>00.82</td> <td>00.82</td> </tr> <tr> <td>For Income Tax</td> <td>Nil</td> <td>Nil</td> </tr> </tbody> </table>		Current Year	Previous Year	For Capital goods	Nil	Nil	For Others	00.82	00.82	For Income Tax	Nil	Nil	For information only.
	Current Year	Previous Year													
For Capital goods	Nil	Nil													
For Others	00.82	00.82													
For Income Tax	Nil	Nil													

Steering and Executive Committee of C-MET (2010-2011)

STEERING COMMITTEE

Prof. T. R. N. Kutty **Chairman**

Emeritus Professor, IISc, Bangalore &
Chairman, Working group,
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Vice-Chancellor,
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Sagar - 470 003, M.P.

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Annual Foundation Day 2011 along with RRCA 2011 at Hyderabad

CENTRE FOR MATERIALS FOR ELECTRONICS TECHNOLOGY (C-MET)

(A Scientific Society under Department of Information Technology,
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