



MCDCM
MULTIDISCIPLINARY CENTER FOR THE DEVELOPMENT OF CERAMIC MATERIALS

REPORT 6

PARTIAL REPORT OF THE MCDCM ACTIVITIES COVERING THE BASIC RESEARCH ,
TECHNOLOGICAL RESULTS AND EDUCATIONAL ACTIVITIES

PERIOD FROM JANUARY 2006 TO DECEMBER 2006

JANUARY 31, 2007

REPORT (6) – MCDCM

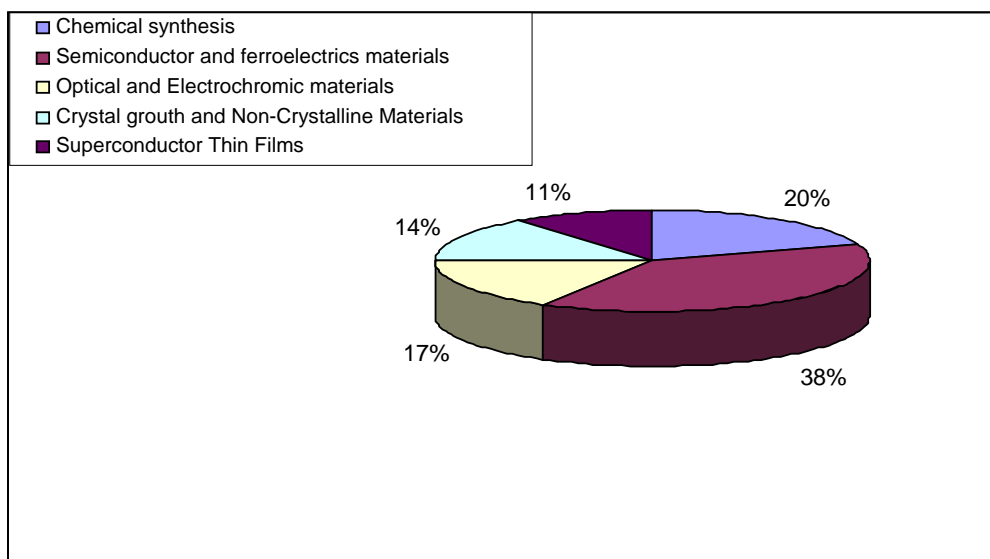
Overview

This report encompasses all the activities developed in the center during this two year. This report shows that in this second year the activities of the center were as intense as in former year for all levels, including the scientific production, innovation activities as well as the continuous education and dissemination of knowledge to the society. As described in this report, in the third year the advances in the research projects was compared with former second years. The productivity of the majority of the groups has been improved year by year, demonstrating that the synergy of the groups by means of collaborations is the key factor. As stated in the former report, the collaborations among members of the center and with other researchers not belonging to the center in the national and international level can be extracted in this report. The members of the center have been published about 132 papers being 127 in international periodicals and about 5 in national periodicals. These numbers is considered very good if we consider that there was a modification in the research structure in the direction and staff of the Magnetic and Superconducting group. Considering the several research areas of the Research Division, the number of papers per area was: Chemical Synthesis = 26; Semiconductors and Ferroelectric Materials = 51; Optical and Electrochromic Materials = 22; Crystal Growth and Non-Crystalline Materials = 19; and Design, Fabrication and Characterization of Microdevices Based on Magnetic and Superconducting Thin Films = 14. Figure 1 shows the relative productivity by research lines.

This high productivity of the center has been acknowledge by the international scientific community, since several leader members of the center have been invited to organize meetings or to give seminars and invited papers in international meetings related with ceramic materials. In this year a member of the center organized a Symposium for 2006 Spring meeting of MRS. In addition, 4 invited papers were given by members of the centers in international meetings, as well as 6 seminars were given in materials science departments all over the world. Moreover, three members received an national Elsevier prize from the CAPES and two members of the center are members of the International Academy of Ceramics, being one of them member of the Advisory Board of the Academy.

The results in the Innovation Division of the Center are growing with other companies join to the center by means of technological research projects. One important factor is the satisfactions of the companies with the results of these join projects. This can be extracted by the fact that the great majority of the companies remain contracting projects with the center year by year.

These achievements are related to the high motivation of several members of the center, as well as the excellent management of the center. Projects have been contracted by large companies like CSN (more than 5 years Faber-Castell (2 years), as well as by medium and small companies (KosmoScience, Nanox, Unilever, Togni among others) resulting only in this year the deposit of 7 patents. Other indicative of the excellence of the work developed with industries, besides the technical solution for the companies, is the high number of joint papers published with members of the companies (6). It should be also stressed that many projects with industries are well related with research line of members of the center. Many projects are related to Tin Oxide based ceramic, which has been studied extensively by the members of Center. In this sense, the degree of innovation is quite high. Our studies in synthesis and doping of tin oxide also originate a project for production of semiconductor enamel for electrical porcelain. This project started last year and have exciting results for commercial applications. The continuous education and dissemination division of the center has increased and diversified the numbers of activities reaching a well-established program for the next years. In this sense, our program in this third year encompassed the diffusion through the lectures in elementary and high schools about several subjects related to the chemistry and physics of ceramic materials as well as the Ceramic Materials Educational Project, as described in the second report. Moreover, in this year was offered by the center a course on nanotechnology for undergraduate students from several universities. Many diversified activities like hosting teachers and high school students, basic courses for craftsman located in several locations, production of educational video, linking PhD students to industrial sector among others.



RESEARCH DIVISION – PERIOD REPORT 2005-2006

In general, we can say that the total number of paper published in the last year is quite expressive. Besides, the quality of the publication is high also. In this last year, we published paper in very good magazines, such as: J. Phys. Chem. B, Chem-Phys-Chem, Applied Physics Letters, Chemistry of materials and others. In this report, we will give a brief description of the basic research activities developed in the last year (2005-2006). More details about a specific project or a specific development can be obtained in the published paper, related to the specific interest. This brief description will be divided into topics related to research areas.

a) Crystal Growth and Non-Crystalline Solids

The main results related to this research topic were related to the use of CO₂ laser to develop dense nanostructured ceramic, crystalline thick films and single crystal fibers for electric, dielectric, ferroelectric and optical applications. For instance, photorefractive crystals (Bi₁₂TiO₂₀) have been grown for holograph register using the Czochralski technique. Glass and glass-ceramic were obtained from the B₂O₃-CaCO₃ system and were sensitive to UV radiation.

b) Electronic ceramics

We have focused our activities in the improvement and development of techniques based on frequency response analysis such as impedance, admittance, dielectric spectroscopy techniques. The use of such techniques guide the study of relaxation processes occurring in ceramics systems based on CaCu₃Ti₄O₁₂, SnO₂, ZnO, TiO₂, etc., helping to find new and better composites based on such systems. Furthermore, these ceramics systems can possess high nonohmic properties or high dielectric constant being applicable in different technological areas. In this area, we can point out also research in the field of alternative energy devices. We developed a fuel based on zirconium oxide, with a good performance. This cell was developed with Brazilian raw material.

On the other hand, to study devices for alternative energy systems we are also using impedance spectroscopy and also developing AC-electrogravimetry technique as well as intensity photocurrent modulated spectroscopy for studying intercalation systems for battery applications and solar cell devices.

We prepared pH electrodes using the oxide binary system: $\text{RuO}_2/\text{TiO}_2$ e $\text{IrO}_2/\text{TiO}_2$. Although pure oxides were proposed as pH electrodes, binary systems were not used before. Once we used Pechini method, we were able to build microelectrodes, with electrode diameter of 5 microns. One of the most important advances in the present electrodes is their low cost, once we used 1 micron thick films over a low cost substrate. We studied also RuO_2 based as supercapacitors. We investigated the preparation variables using chemometrics methods.

We devoted special attention to the development and basic research to understand the photoluminescence phenomena in amorphous materials. In this field, significant results were obtained combining theoretical calculation based on *Ab Initio* quantum mechanical calculation and experimental results. In fact we believe that a structural disorder promote a disorder in the electronic structure of the material, resulting in photoluminescence properties.

c) Chemical Synthesis

In this field, we developed in the last year a new synthetic route to process nanomaterials based on peroxide precursors. This new route was used to develop materials with application in alternative energy devices, such as TiO_2 (solar cell) and Nb_2O_5 (solar cell and smart windows). For instance, Ti Niobia-phase nanocrystals with controlled morphology were obtained by the hydrothermal treatment of a Niobium peroxy-complex precursor at very low temperatures. The materials obtained by this route presented a very high surface area (ranging from 79 to 327 m^2/g), disordered NbO_6 , NbO_7 and NbO_8 polyhedra, Nb-O superficial sites and a superficial OH group, which must have ensured the acidic characteristics of this oxide. In this area we can point out also the synthesis of TiO_2 nanorods. Titania, or titanium oxide (TiO_2), is a functional material for which there are several technological applications strongly related to its crystalline structure and nanocrystal size and morphology. Each phase of TiO_2 displays different physical properties having different functionalities. Thus, from the technological and scientific standpoint, it is important to develop new routes of synthesis whereby the crystalline structure and the size and shape of TiO_2 nanocrystals can be tailored. The literature contains reports of several studies on the synthesis of nanorods of TiO_2 in the rutile phase. Despite these recent efforts to synthesize Rutile nanorods, the mechanism responsible for the growth process remains unclear. In the last year, we developed an alternative route to process TiO_2 (rutile phase) nanorods and identified the Oriented Attachment (OA) process as the predominant nanocrystal growth mechanism. This is the first time the growth of TiO_2 (rutile) nanorods has been associated with this mechanism. The identification of the OA as growth mechanism is of general interest and can help the

development of new or improved synthesis approach in order to obtain nanocrystal with controlled morphology.

Other important topic that we devoted special attention was the study of nanocrystal growth mechanism during the synthesis process. In this area we proposed a new kinetic model to explain the OA in colloidal suspension. This kinetic model is based on the collision of nanocrystals with the same crystallographic orientation (in this model the nanocrystal are treated as molecules). A kinetic equation is proposed and it was apply to describe the growth process of different nanocrystal, such as: SnO₂, ZnS, InAs and CdSe. The model proposed can be very useful to describe the growth process of nanocrystal that is not based on Ostwald ripening mechanism. Moreover, this model is an effort to introduce an analytical interpretation of the oriented attachment mechanism.

Technological Results

In terms of technological innovations, the Center developed several projects of strong industrial interest, which resulted in several patents and papers. The interaction with industries was conducted through specific projects with the different segments.

The projects developed in the metallurgical sector, consisted in advanced refractories that have to be applied in order to secure high metal quality from economical and ecological aspects. During services, refractories must not only tolerate high temperature but also withstand stress (thermal and / or mechanical) as well resist to combined attack by liquids such as molten metals, slags and fluxes.

Researchers of the MCDCM also support the improvement of the quality of ceramic products by determining the characteristics of the products being processed by several companies and improving the processing of those products. New products have been developed for several companies by means of technically and economically feasible chemical processes. This effort is exemplified with the projects of technical and scientific cooperation with Companhia Brasileira de Metalurgia e Mineração (CBMM). The nanosized niobium oxide being processed using polymeric precursor method and spray pyrolysis has been used for the production of niobium oxide powders.

The most important projects related to the technological section are:

- 1) Fireclay refractories produced with Low Temperature (<500°C) refractory aggregates (grog). Sponsoring Company – Refratário Scandelari S/A, Localization – Lapa – PR. A new processing route was developed for the production of fireclay aggregates (grog) to be

used in the fabrication of fireclay refractories (class of 30 –35% Al₂O₃). There is a great demand for this kind of aluminum silicate refractories, specially in the sugar cane and agro business. The generic use of hard fired fireclay grogs (>1300°C) leads to a low profit margin in the final product. The developed technology is very attractive commercially considering it brought the grog cost to one third of the current one, providing a larger profit margin.

- 2) Development of automotive temperature sensors. Metalurgica Iguaçu Ltda. Different kinds of perovskite-based NTC temperature sensors have been synthesized by mixing, pressing and sintering Ni, Cu, Mn, and Co oxides. Some compositions have also been synthesized by a modified polymeric precursor technique. The electrical characterization was carried out by dc methods. An experimental sequence for producing large quantities of each composition was evaluated for the scaling up of the thermistor production. The challenge posed by local industries looking for Brazilian-made temperature sensors for application in the automotive industry has been overcome: four out of six thermistors with behavior similar to commercial thermistors have been successfully developed.
- 3) Development of translucent alumina pieces for dentistry applications. This project was contracted by Tecident Ltda., of the dentistry sector aiming to produce translucent alumina brackets.
- 4) Ceramic processing of graphite. This project was contracted by Faber Castell and is under development. The project consists in adjustment of processing of the graphite aiming to obtain graphite with higher mechanical resistance by using the injection molding and nanostructured dopants. This project resulted the patent 4 described in this report.
- 5) Chemical/Ceramic Synthesis/Innovation. The group devoted efforts to the development of a new class of ceramic powders deflocculant based on pre-polymeric chemicals and managed to do so.
- 6) The group devised a new testing method for pure shear evaluation of concrete specimens, devoted to evaluate the effect of fiber reinforcement on shear of Portland concrete, specially for keyed structures in bridges.
- 7) The group has developed a new aluminum silicate (fireclay class) refractory composition for the Company Refratário Scandelari, using cheaper raw materials mined near the company headquarters, in substitution for a special flint clay which was mined 500km away from the company.
- 8) Development of a fuel leak sensor for commercial and industrial reservoirs; project financed by The Ipiranga Petroleum Company.

- 9) Development of a low-cost multi-use laser gun for law-enforcement forces; project financed by UFSCar.
- 10) Development of an industrial process to obtain large quantities of ferromagnetic graphite ; project financed by National de Grafite Inc.
- 11) Refractory products for anode baking furnaces. Refractories used in anode baking furnaces must be renewed regularly. There are several stresses acting on the refractory lining. The extent of these stresses will vary somewhat between an open and a closed pit furnace, but generally the origin and the implications of the stresses are the same. This project contracted by Togni S.A. Materiais Refratários has been concluded. A post mortem study objective of determining the mechanism of the corrosion developed during the industrial application. It was concluded that containing a high amount of calcium and sodium aluminum-silicate interacts with the microstructure of the refractory promoting the corrosion.
- 12) Development of nanoparticulated ceramic pigments for masterbatches production. This project was contracted by COPOL – Compostos Poliméricos industry, São Carlos, SP. The first step of the Project has been concluded.
- 13) Development of a nanocomposite for fire retardant. This project was contracted by Brascabos, Rio Claro, SP. This project is under progress.
- 14) Presently the artistic and china ware ceramics are the most competitive in the international market. In order to improve the regional competitive conditions, it was signed an extended contract project with 29 industries of the Ceramic Park of Pedreira (SP). The project focused two main line actions: 1) development of batch formulation; 2) establishment of a conceptual base as the design trade mark for the ceramic ware produced in Pedreira. The new batch formulation, using a new set of raw materials, allowed a cost reduction with raw materials as well as an improvement of the properties of the final products. It can be emphasized the reduction of water absorption from 32% to 11% in the ceramic ware. The design project consisted in modifying the geometry of ceramic articles, the design of ceramic products as well as to propose the idea of that the segmentation of the product lines in small industries bring advantages in terms of production and commercialization of the ceramic ware.

EDUCATION AND DISSEMINATION

In this period, the main focus of the activities was on Nanoscience and Nanotechnology due to the lack of information of students and teachers. A special DVD developed by the Center members was exhibited among with lectures and seminars in order to make these subjects more clear to the students.

Our activity with students participation was the 2nd Mathematics, Physics and Chemistry Olympiad (MPCO) having approximately 2000 young students from public school. It is important to point out that only students from public schools were allowed to participate. Twenty-six cities of the central region of Sao Paulo State attended this event.

The previous projects, especially PEMCe (Ceramic Materials Educational Project), have been continued with themes such as Clays: properties and applications, Carbon element, Nature: problems and perspectives and Recycling Materials. These short-courses were applied to 12-14 year-old students. A specific activity was performed with recycling materials where the students had the opportunity of making an experiment of paper recycling.

Challenges and Hindrance

Our principal challenge for the next period will be to organize the 3th MPCO which have an expectation of 5000 students of 35 cities. The main point will be to have budget to do all activities necessary and to make the prize-day.

We are also planning a long-course for teachers about Nanoscience (Nanodialogue: A course about the nanometric world). Here, the main objective will be to transform the scientific language into more accessible texts for teachers without losing the knowledge. The hindrance of keeping the continuous education and dissemination lies on the small financial support to perform all the planned activities. Our experience has shown, during all these years, that it is possible to reach more and more students, however it is very important to have money and specific scholarships to form a staff. We have a minimum time for the Center members to start activities with students. It is necessary a training to get excellent and continuous results.

A total of 6233 students participated in the activities related to education and science dissemination during the 2006 school-year.

Production of 3D Animation

In this period, four 3D animations were produced (films during 2-3 minutes). They were exhibited in high schools and during lectures in the country and abroad. The main objective of the animations is to show in a clear and scientific way the development of the research activities of the Center, mainly in Nanostructured Ceramics and Nanoparticles, Ceramic Interfaces, Varistors, and Sensors. In addition, there has been a great interest from regional TV stations to show the animations associated with the research activities undertaken by the Center, which has resulted in an average of one monthly interview in the TV channel of the highest audience in the region. Nowadays, this way of diffusion has already guaranteed a space in the national media in paid TV channels.

One Day of Undergraduate Student

Researchers of MCDMC have participated of the open school day in Diocesano School (São Carlos) presenting the comic book to stimulate the students discussing about clay, mineral exploration and electronic ceramics.

Participation of the Center in National and International Reviews

a) The Ceramic Center, with Dr. Reginaldo Muccillo as the Principal Editor, selects and edits the Revista Cerâmica, the official journal of the Brazilian Ceramic Society. Prof. Dr. J. A. Varela. Prof. Dr. E. Longo and Prof. Dr. E. R. Leite, other members of the Center, also belong to the editorial board of Revista Cerâmica.

b) The Center has also a strong participation in the journal Revista Cerâmica Informação, edited by Faenza Editrice do Brasil Ltda. Prof. Dr. J. O. Paschoal, a member of the Center, is the Technical – Scientific Editor of the journal and Prof. Dr. E. Longo is also one of the members of the technical – scientific council.

c) Members of the ceramic center had strong participation as referees of international journals such as J. Am. Ceram Soc., Advanced Materials, J. Am. Chem. Soc., and others. The

group has a member (Prof. Dr. Edson R. Leite) of the editorial board of the J. Nanoscience and Nanotechnology.

Diffusion in Newspapers, Radio and TV

It is important to point out the interface of MCDCM with the media. In this period, information about Ceramic Materials was disseminated by means of written press, radio and TV. Newspapers from São Carlos (Primeira Página, A Folha, Notícias FIESP/CIESP and Tribuna), and Araraquara (Imparcial) have covered news about MCDCM achievements in the Innovation Projects, emphasizing the development of materials made in partnership with CSN, Togni Refratários SA, NANOX, Angelus LLPI Ltda, IIPF-EMS, KosmoScience and Faber-Castell. O Diário Oficial (Imprensa Oficial), and O Estado de São Paulo (a newspaper of national coverage) also reported the achievements of MCDCM emphasizing the advantages that the industrial partners of MCDCM have had with such a fruitful partnership, Magazines: Ciência Hoje, Pesquisa (FAPESP), and Época.

The technical developments obtained in Materials Science (photoluminescence, nanoparticles, and nanostructure) has benefited the whole region, showing clearly the multiplying role of the University-Industry interaction. As a consequence, EPTV, the main TV company of the Central Region produced a serie of reports covering the activities of MCDCM and TV-Cabo Branco (State of Paraíba), and TV Ponta Negra (State of Rio Grande do Norte).

Production of DVD

- 1 – Nanoscience and Nanotechnology, edited by LIEC UFSCar/MCDCM
- 2 – Mathematics, Physics and Chemistry Olympiad (MPCO), edited by CCMC USP/MCDCM
- 3 – Cosmetics and Nanotechnology, edited by LIEC Araraquara/ MCDCM
- 4 – Nanostructured Ceramics, edited by LIEC UFSCar

MCDCM in the School

- 1 - Short-courses on Materials Science
- 2 – Lectures and seminars on Nanoscience and Nanotechnology
- 3 – Workshop of the Knowledge in the cities of São Carlos and Ribeirão Bonito.

(Organized by schools)

4. National Science and Technology Week: Seminar and exposition

attach 1

**results of the research division
(basic research)
list of international and national
publications**

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patents

1 - L. G. P. SIMÕES, C. Ribeiro, A. L. Araújo, D. T. Minozzi, C. A. Paskocimas, E. R. Leite, E. Longo, J. A. Varela – PI0600327-3 - intitulada "COATING CERAMICO NANOESTRUTURADO BACTERICIDA E RESPECTIVO PROCESSO DE OBTENÇÃO".

2 - L. G. P. SIMÕES, C. M. Barrado, C. Ribeiro, A. L. Araújo, D. T. Minozzi, E. R. Leite, E. Longo, J. A. Varela - PI0603156-0 - intitulada "CÉLULA HIDROTHERMAL PARA SÍNTESES E PROCESSAMENTO DE MATERIAIS.

3- S. R. FONTES; E. LONGO; C. A. FORTULAN; L. F. PORTO; R. N. HANEDA E R. DEL COLLE "Processo de microfiltração tangencial para retenção de microrganismos (E.Coli) em estruturas microporosas à Base de Alumina (Al₂O₃)/prata metálica, mediante Impregnação por Solução portadora de nano-partículas de prata - ISP" – PI0604068-3

4- S. R. Fontes; E. Longo; C. A. Fortulan; L. F. Porto; R. N. Haneda e R. Del Colle "Processo para separação de misturas estáveis de óleo vegetal/água, através do processo de filtração tangencial utilizando como meio filtrante tubos cerâmicos microporosos monocamada, à base de alfa-alumina-zirconia, mediante impregnação por solução portadora de zirconio-ISP". PI0604067-5

5- J. D'amico Neto, C. A. Paskocimas, E. Longo, "Processo de produção de componentes cerâmicos à base de alumina e/ou zircônia coloridos por pigmentos nanométricos", nº provisório 018060034520.

6- C.A Paskocimas, E. Longo, W. Kolbayashi, J. A. Varela – Method for producing corrosion resistant refractories. JAPAN 228258.

7- R. C. de Lima, E. Longo, J. A. Vasconcellos, N. S.L. Vasconcellos, C.s A. Paskocimas, E.R. Leite, E. Longo, J. A. Varela "Método e aparato para obtenção de nanopartículas de alumina gama na cor preta usando forno microondas" PI0600360-5.

attach 3

**continuous education
and dissemination division**

A total of 6233 students participated of activities related to education and science dissemination during the 2006 school-year.

I – MCDCM in the School

1.1 – Short-course about materials science

Activities	School name and city	Day/Month	Students present
Clays: properties and applications	Escola Athenas/ Objetivo – Cajuru city, SP.	07/04	72
	E.E. Gabriel Félix do Amaral – São Carlos city	15/05	30
Nanoscience and nanotechnology	<i>E.E. Gabriel Felix do Amaral – S. Carlos city</i>	11/09-18/10	123
	E.E. Dr. Pirajá da Silva, Ribeirão Bonito city	30/10-31/10	85
	E.E. Prof. José Juliano Neto, São Carlos city	28/11	152
Carbon element	<i>E.E. Gabriel Felix do Amaral – S. Carlos city</i>	11/09-04/10	95
	E.E. Dr. Pirajá da Silva, Ribeirão Bonito city	30/10-31/10	84
	E.E. Prof. José Juliano Neto, São Carlos city	28/11	152
	E.E. Sebastião de Oliveira, São Carlos city	30/11	60
Nature: problems and perspectives	<i>E.E. Gabriel Felix do Amaral – S. Carlos city</i>	23/08-14/09	203
	E.E. Prof. José Juliano Neto, São Carlos city	09/11	56
Materials recycling	<i>E.E. Gabriel Felix do Amaral – S. Carlos city</i>	23/08-28/09	273
	E.E. Prof. José Juliano Neto, São Carlos city	07/11-09/11	200
	E.E. Sebastião de Oliveira, São Carlos city	04/12	25

1.2 – Lectures and seminar about nanoscience and nanotechnology

Activities	School name and city	Day/Month	Students present
Materials for society and the nanotechnology	University of Sao Paulo State (UNESP), Bauru, city	31/03	45
Materials for society with technological innovation	Federal University of Sergipe, Aracaju city	21/04	33
Nanoscience and nanotechnology at USP SCarlos	Science and Technology Minister, Brasilia city	25/05	16
Nanoscience and nanotechnology: What are these?	Colégio Metropolitano-Piracicaba city	29/05	90
University-industry relationship: Reality or dream?	University of Sao Paulo State (UNESP), Ilha Solteira city	13/07	30
"Macro, micro and Nanomaterials: an opportunity to scientific cooperation	Federal University of Sergipe, Aracaju city	11/08	55
Nanoworld and the scientific diffusion: a new challenge	Federal University of Ouro Preto, Ouro Preto city	23/08	45
"Macro, micro and Nanomaterials: an opportunity to scientific cooperation	Federal University of Ouro Preto, Ouro Preto city	24/08	35
Laser for the development and processing of micro and nanostructured materials	Federal University of Goiás	10/10	35
The science changing our life with the nanotechnology	Clube Avenida Night Club/ Monte Aprazível city	23/10	273
University and society	Federal University of Goias Campus Catalão	31/10	400
The science changing our life with the nanotechnology	Colégio Núcleo Educativo/Teorema - Catalão city	01/11	50

**1.3 – Workshop of the Knowledge at Sao Carlos and Ribeirão Bonito cities
(Organized by schools)**

Activities	School name and city	Day/Month	Students present
100 years of the 14 Bis	E.E. Dr. Pirajá da Silva, Ribeirão Bonito city	24/11	185
Faquir's bed: Physics or illusion?	E.E. Prof. José Juliano Neto, São Carlos city	28/11	200
Evaluation of the water absorption capacity by special polymer	E.E. Prof. José Juliano Neto, São Carlos city	28/11	200

1.4. National Science and Technology Week: Seminar and exposition

Activities	School name and city	Day/Month	Students present
From 14-bis to Airbus-380: What did we see and what will we see?	<i>E.E. Gabriel Felix do Amaral, São Carlos city</i>	20/10	35
Curiosities about the airplane	<i>E.E. Gabriel Felix do Amaral, São Carlos city</i>	24/10	20
Faquir's bed: Physics or illusion?	E.E. Prof. José Juliano Neto, São Carlos city	20/10-24/10	690

II. School in the MCDMC

2.1 Teaching Science through experiments

Activities	School name and city	Day/Month	Students present
Lectures and physics experiments demonstration at Institute of Physics of S. Carlos, USP	Colégio Objetivo/ Fernandópolis, José Bonifácio, Monte Aprazível and Poloni cities	02/06	46
	Escola Estadual José Ferreira da Silva, Descalvado city	24/11	15
	Escola Estadual Fulvio Morganti, Ibaté city	01/12	40

2.2 Competition on fundamentals science

Activities	Day/Month	Students present
2 nd Mathematics, Physics and Chemistry Olympiad (MPCO)	10/06	1900
MPCO prize-day and seminar	02/09	185

III. Production of DVD

- 1 – Nanoscience and Nanotechnology, edited by LIEC UFSCar/MCDMC.
- 2 - Mathematics, Physics and Chemistry Olympiad (MPCO), edited by CCMC USP/MCDMC.
- 3 – Cosmetics and nanotechnology, edited by LIEC Araraquara/ MCDMC.
- 4 – Ceramic nanostructured, edited by LIEC UFSCar.

IV. Participation of the Center Members at National Education Congress

1. "Ensinando conceitos de química para alunos de quinta-série do ensino fundamental, tendo como tema de estudo os materiais cerâmicos", Ariane Baffa Lourenço, Dácio Rodney Hartwig, Antonio Carlos Hernandes, XIII Encontro Nacional de Ensino em Química, Campinas, SP, 24 a 27 de julho de 2006.
2. "Uso de recurso audiovisual no ensino do ciclo dos materiais: a reciclagem como tema", Juliana Mara P. de Almeida, Ariane Baffa Lourenço, Antonio Carlos Hernandes, 14º Simpósio Internacional de Iniciação Científica da Universidade de São Paulo, São Paulo, SP, 08 a 10 de novembro de 2006.
3. "O uso de recurso audiovisual no Ensino de Ciências: o Meio Ambiente como tema", Larissa Marin R. Silva, Ariane Baffa Lourenço, Antonio Carlos Hernandes, 14º Simpósio Internacional de Iniciação Científica da Universidade de São Paulo, São Paulo, SP, 08 a 10 de novembro de 2006.
4. "Uso de recurso audiovisual no Ensino do elemento carbono a alunos do Ensino Médio", Adriana Marques, Ariane Baffa Lourenço, Antonio Carlos Hernandes, 14º Simpósio Internacional de Iniciação Científica da Universidade de São Paulo, São Paulo, SP, 08 a 10 de novembro de 2006.
5. "Ensinando Nanociência e Nanotecnologia para alunos do Ensino Médio", Marcelo Pereira da Silva, Ariane Baffa Lourenço, Antonio Carlos Hernandes, 14º Simpósio Internacional de Iniciação Científica da Universidade de São Paulo, São Paulo, SP, 08 a 10 de novembro de 2006.
6. "Uso de recurso audiovisual no ensino do ciclo dos materiais: a reciclagem como tema", Juliana Mara P. de Almeida, Ariane Baffa Lourenço, Antonio Carlos Hernandes, 1º Semana da Licenciatura, São Carlos, SP, 25 a 28 de setembro de 2006.
7. "O uso de recurso audiovisual no Ensino de Ciências: o Meio Ambiente como tema", Larissa Marin R. Silva, Ariane Baffa Lourenço, Antonio Carlos Hernandes, 1º Semana da Licenciatura, São Carlos, SP, 25 a 28 de setembro de 2006.
8. "Uso de recurso audiovisual no Ensino do elemento carbono a alunos do Ensino Médio", Adriana Marques, Ariane Baffa Lourenço, Antonio Carlos Hernandes, 1º Semana da Licenciatura, São Carlos, SP, 25 a 28 de setembro de 2006.
9. "Ensinando Nanociência e Nanotecnologia para alunos do Ensino Médio", Marcelo Pereira da Silva, Ariane Baffa Lourenço, Antonio Carlos Hernandes, 1º Semana da Licenciatura, São Carlos, SP, 25 a 28 de setembro de 2006.
10. "Projeto de pesquisa: Metodologia possível para o ensino de Física", Gláucia Grüninger Gomes Costa, Ariane Baffa Lourenço, T. Catunda e A. C. Hernandes, XVII Simpósio Nacional de Ensino de Física, São Luis, MA, 29 janeiro - 02 de fevereiro 2007.

attach 4

diffusion in newspaper, radio and tv

DIFFUSION BY THE MEDIA: (NEWSPAPERS, RADIO and TELEVISION)

01/04/2006 - Empresas de cerâmica recebem apoio da Unesp.
(Jornal "O Imparcial", page 3)

01/04/2006 – 30 empresas de Cerâmica Recebem Apoio Tecnológico.
(Jornal "Primeira Página", page 4).

01/05/2006 - Trinta empresas de cerâmica recebem apoio Tecnológico do CMDMC e LIEC
Conheça o trabalho do CMDMC e LIEC na cidade de Pedreira.
(Jornal "A Folha", page 5)

01/24/2006 - UFSCar desenvolve nanofita capaz de fazer conexões com circuitos.
(Jornal "Primeira Página", page B2).

01/25/2006 - LIEC e empresa de São Carlos inovam na odontologia -LIEC desenvolve 1º bracket cerâmico nacional para tratamento ortodôntico.
(Jornal "Primeira Página", page B7)

January and February of 2006 – Nanotecnologia.
(Jornal da Unesp pages 8 and 9).

03/09/2006 - Grupo de Cerâmica da USP Faz Parceria com Prefeitura de Pedreira.
(Jornal "A Folha" page 08).

03/21/2006 – Documentary on Nanotechnology: "Nanotecnologia: o futuro" – April, 13th, at Florestan Fernandes Auditorium, UFSCar.

03/21/2006- Pesquisa avalia fotoproteção das fibras capilares.
(Jornal A Folha, page 5)

04/09/2006- LIEC lança documentário "Nanotecnologia: O futuro".
(Jornal "O Imparcial", page 4)

04/28/2006 – CMDMC Organiza II Olimpíada de Matemática, Química e Física.
(Jornal "O Imparcial" page 4).

05/21/2006 – Nanotecnologia como Solução de Problemas.
(Jornal "A Tribuna Imprensa" pages 6 and 7.

05/25/2006 – Prato Comemorativo aos 30 Anos da UNESP.
(Jornal "O Imparcial" page 8).

05/26/2006 – Nanotecnologia: Vamos Construir com átomos e Moléculas.
(Jornal " O Imparcial" page 2).

05/28/2006 – Nanotecnologia: Vamos Construir Átomos e Moléculas.
(Jornal " A Folha" page 7).

06/06/2006 - Jogo desenvolvido pela equipe de difusão do CMDMC foi sucesso no 50º Congresso Brasileiro de Cerâmica - Segundo Ariane Baffa Lourenço o jogo é uma forma simples de explicar a história e os conceitos básicos da argila e cerâmica.

06/06/2006 - Palestra ministrada para estudantes do ensino médio de Piracicaba visa estimular o ingresso na Universidade. - A palestra faz parte do projeto Centro Cerâmico na Escola realizado pela equipe de difusão do CMDMC

06/09/2006 - Segunda edição da Olimpíada de Matemática, Química e Física registra 1900 Alunos inscritos. Será dia 10 de junho a segunda edição da Olimpíada de Matemática, Química e Física direcionada para estudantes do ensino médio de escolas públicas - Divulgado resultado da II Olimpíada de Matemática, Química e Física.

06/11/2006 - Nanopartículas de prata e zircônio em pesquisas inovadoras.
(Jornal "A Folha", page 5)

07/04/2006 - CMDMC desenvolve dosímetro para radiação ultravioleta utilizado em bronzamento artificial.
(Jornal "O Imparcial", page 4).

07/13/2006- Cerâmica artística de Pedreira em exposição no shopping em São Carlos.
(Jornal "O Imparcial", page 6).

07/16/2006- Forno de microondas: da cozinha à nanotecnologia.
(Jornal "O Imparcial", page 20).

07/25/2006 – Pesquisadores da Região Criam Jogos Científicos
(Jornal "O Imparcial" page 6).

07/28/2006 – Centros de Pesquisa da Fapesp Promovem Palestras educativas na Escola Álvaro Guião
(Jornal "A Folha" page 3).

July/2006- LIEC gera pesquisas e empresas inovadoras.
(Revista Ciência e Tecnologia, page 10).

July/2006- Novos materiais: mais pureza e desempenho.
(Revista Ciência e Tecnologia, page 11).

Julho/2006- Nanotecnologia: a revolução industrial do século XXI.
(Revista Ciência e Tecnologia, page 18).

08/27/2006 – Pesquisadores da UNESP Otimizam Produção de Aço da CSN.
(jornal "O Imparcial" page 06).

08/31/2006 – Centro Multidisciplinar de Materiais Cerâmicos Desenvolve Sensores e Tecnologia para a Produção de energia Limpa.
(Jornal "A Folha" front page and page 8).

08/31/2006 – Parceria do IQ Aplica Nanotecnologia em Secador de Cabelos.
(Jornal "O Imparcial" page 6).

09/01/2006 – Pesquisadores do IQ/UNESP Liceram Lista dos Mais Produtivos do Brasil.
(Jornal "O Imparcial", front page and page 4).

09/01/2006 – Nanotecnologia Produz Secador Anticaspa.
(Jornal "Tribuna Imprensa" page 8).

09/02/2006 – Pesquisadores do IQ são os Mais Produtivos.
(Jornal “O Imparcial”, page 2).

09/17/2006 – Premiação da II Olimpíada de Matemática, Química e Física Agradou os Participantes.
(Jornal “O Imparcial” – front page and page 17)

October/2006 – Nanotecnologia Rende Patentes Brasileiras, Jornal “A Semana C&T”.
3rd edition, page 10.

11/04/2006- Laboratório de Centro de Materiais Cerâmicos desenvolve Síntese Hidrotermal com tecnologia desenvolvida no LIEC
(Jornal “A Folha”, page 5).

11/05/2006- Cientistas mais produtivos do país estão nas Universidades da região
(Jornal “O Imparcial”, page 7)

01/11/2006- Pesquisadores da UFSCar recebem prêmio da Capes e Elsevier.
(Jornal “A Folha”, page 1)

12/09/2006 – DVD Aborda Nanotecnologia.
(Jornal “Tribuna Imprensa” page 16).

Television - Interviews (2006)

1 – Theme: Nanotecnologia (duration: 3 minutes and 37 seconds);

2 – Theme: Brackets Cerâmicos (duration: 1 minute and 27 seconds);

3 – Theme: Sensor para Catalisador Automotivo: Cerâmica Inteligente (duration: 2 minutes and 16 seconds);

4 – Theme: Nanotecnologia em Cosméticos (duration: 2 minutes and 32 seconds);

5 – Theme: Fibras Cerâmicas na Construção Civil (duration: 1 minute and 51 seconds);

6 – Theme: Redução da Impregnação de Nicotina nos Cabelos (duration: 1 minute and 32 seconds).

WEB

05/18/2006 – **CMDMC Blog** implementation (<http://blog.cmdmc.com.br>): diffusion of news of CMDMC and other research institutions.

News on the homepage: LIEC/UFSCar, LIEC/IQ/UNESP, CMDMC:

01/05/2006 - Trinta empresas de cerâmica recebem apoio Tecnológico do CMDMC e LIEC
01/24/2006 - LIEC e empresa de São Carlos inovam na odontologia
01/26/2006 - BNDES: R\$ 1 bilhão para empresas que inovarem em tecnologia em 2006
02/14/2006 – 1º Escola Avançada de Óptica e Fotônica
02/21/2006 - Edital do CMDMC para 2006
03/06/2006 - Veja o Jornal do CMDMC on-line
03/21/2006 - DVD sobre Nanotecnologia - Evento de lançamento dia 13/04 às 19:00hs
04/12/2006 - Ensino de ciências para alunos da cidade de Cajuru
04/24/2006 - Boca mais colorida
05/18/2006 - Equipe de difusão do CMDMC realiza curso sobre ciência
06/06/2006 - Jogo desenvolvido pela equipe de difusão do CMDMC foi sucesso no 50º Congresso Brasileiro de Cerâmica
06/09/2006 - Segunda edição da Olimpíada de Matemática, Química e Física registra 1900 alunos inscritos
06/06/2006 - Palestra ministrada para estudantes do ensino médio de Piracicaba visa estimular o ingresso na Universidade
06/11/2006 - Divulgado resultado da II Olimpíada de Matemática, Química e Física
06/11/2006 - Alunos do ensino médio desenvolvem projeto no Centro Cerâmico da USP
06/11/2006 - II Olimpíada de Matemática, Química e Física
07/02/2006 - Centros de excelência
07/02/2006 - Inovação paulista
08/29/2006 - Elson Longo recebe título de Cidadão São-carlense
07/24/2006 - REDE CMDMC - Alunos, ex-alunos e pesquisadores podem se cadastrar
08/29/2006 - Elson Longo recebe título de "Cidadão São-carlense"
08/09/2006 - Pesquisas do CMDMC otimizam produção de aço da CSN
09/05/2006 - Pesquisadores do LIEC lideram ranking dos mais produtivos do Brasil
09/05/2006 - Premiação
09/13/2006 - Soluções pequenas e eficientes
10/30/2006 - Pesquisadores do CMDMC se destacam no V Encontro da SBPMat
10/30/2006 - CMDMC lança Blog Científico
11/07/2006 - Prêmio Scopus 2006
11/06/2006 - Nanotec 2006 começa hoje em São Paulo
11/08/2006 - Cientistas mais produtivos do país recebem Prêmio SCOPUS 2006
11/08/2006 - Nanotecnologia: Brasil não avalia impactos
11/09/2006 - Produção reconhecida
11/13/2006 - Fotos da Entrega do Prêmio Scopus
11/16/2006 - Circuito completo
12/11/2006 - Produtividade acadêmica
12/11/2006 - Vaga para pós-doutoramento
12/11/2006 - Brasil contribui para avanços em nanotecnologia de metais
12/12/2006 - Professores do CMDMC são homenageados na UNESP – Araraquara
12/13/2006 - IQ/Unesp homenageia diretores do CMDMC

07/18/2006 – CMDMC Net Implementation (www.cmdmc.com.br/redecmdmc) – The main goal of the homepage to continuously increase the interaction between CMDMC researchers and also to diffuse some scientific knowledge to the community.

The CMDMC Net provides an agile information system by the future events, PDF manuscripts and news that can be easily posted by its members. In this manner, the scientific communication among the CMDMC Net members is quite easy, being also available to the community.

attach 5

budget

Considering now the innovation division, in our opinion, the best way to evaluate the innovation is take in to account the total amount of money, number of patents and number of PhD former students that was contracted by companies that we interacted. Table I presents a summary of our innovation activities during the first period.

Company	Investment
<i>Faber-Castell</i>	<i>R\$ 60.000,00</i>
<i>CBMM</i>	<i>R\$ 15.000,00</i>
<i>Alcoa</i>	<i>R\$ 40.000,00</i>
<i>CSN</i>	<i>R\$ 235.000,00</i>
<i>Unilever</i>	<i>R\$ 169.000,00</i>
<i>Togni S.A.</i>	<i>R\$ 38.000,00</i>
<i>FINEP / EMS - IIPF</i>	<i>R\$ 1.320.000,00</i>
<i>CNPq</i>	<i>R\$ 500.000,00</i>
<i>TOTAL</i>	<i>R\$ 2.377.000,00</i>

attach 6

team list principal researchers

NAME	INSTITUTION	POSITION/RESPONSIBILITY
E. LONGO	UNESP	Center Director
J.A. VARELA	UNESP	Innovation Division
A.C. HERNANDES	USP - IFSC / São Carlos	Continuous Education for Teachers
L.O.S. BULHÕES	UFSCar	Electrochromic and Optical Materials
J.B. BALDO	UFSCar	Refractories and Corrosion
F.M.A. MOREIRA	UFSCar	Superconductors and Magnetic Materials
E.C. PEREIRA	UFSCar	Semiconductor and Electrochromic
E.R. LEITE	UFSCar	Ferroelectric Thin Films and Chemical Synthesis
V.R. MASTELARO	USP / IFSC	Non-Crystalline Materials and Structural Characterization.
M. CILENSE	UNESP	Semiconductors and Ferroelectric Materials and Electroceramic Devices
R. MUCCILLO	IPEN	Intragranular phenomena in Ceramic Oxides Technology: Development of Ceramic Sensors
E. MUCCILLO	IPEN	Intragranular phenomena in Ceramic Oxides Technology: Development of Ceramic Sensors
R. JARDIM	IFUSP	Magnetic Materials
M.A. ZAGHETE	UNESP	Powder Synthesis
C.O. PAIVA-SANTOS	UNESP	XRD and Rietveld Method

SENIOR RESEARCHERS

NAME	INSTITUTION	SUBPROJECT
W. LIBARDI	UFSCar/DEMa	Vice Coordinator - Refractory Laboratory
L. A. PERAZOLLI	UNESP	Semiconductors
A.J.A. OLIVEIRA	UFSCar	Magnetic Materials
J.O.A. PASCHOAL	IPEN	Continuous Education for Workers and Ceramic Tiles
P.R. BUENO	UNESP	Nanostructured Materials for Clean Energy

JUNIOR RESEARCHERS

NAME	INSTITUTION	SUPERVISOR
M. ESCOTE	UFSCar	E. LONGO
F. I. M.COSTA	UFSCar/LIEC	L. O. S. BULHÕES
M.C. SANTOS	UFSCar/LIEC	L. O. S. BULHÕES
F. J. SANTOS	UNESP	J. A. VARELA
S. CARTREEDGE	UNESP	J.A. VARELA
M.R.B. ANDREETA	USP/IFSC	A.C.HERNANDES
M.I.B.BERNARDI	USP/IFSC	A.C.HERNANDES
C. A. CARDOSO	GMD/ DF / UFSCAR	F.M. ARAÚJO-MOREIRA
A. A. CAVALHEIRO	UNESP	E. LONGO
A. Z. SIMÕES	UNESP	E. LONGO
I.C. COSENTINO	IPEN	R.MUCCILLO
F.C. FONSECA	IPEN	R.MUCCILLO
H.M. VIANA	IPEN	R. MUCCILLO
J.S. COSTA	DEMa/UFSCar	J.B. BALDO
M. M. VILLULLAS	LIEC/UFSCAR	L.O.S. BULHÕES

LIST OF POST-DOC, Ph. D., M. Sc. AND SCIENTIFIC INITIATION STUDENTS

Adaci Batista Campos – Study of Mo-based and W-based photoluminescent compounds. Earth alkaline molybdates and tungstates with scheelite structure have been extensively studied due to the high potential of their technological applications as photoluminescent materials. Adviser: Prof. Dr. Elson Longo.

Ailton Massaiti Watanabe – Application of the electroacoustical admittance (impedance) technique in the study of biosensors based on the set of piezoelectric transducer/self-supported film. Adviser: Prof. Dr. Paulo Roberto Bueno

Alberthmeiry Teixeira de Figueiredo – Study of the photoluminescent properties of CaTiO_3 and $\text{Ca}_{1-x}\text{Sm}_x\text{TiO}_3$. In this project it is proposed to utilize the room temperature photoluminescent emission of titanates as a tool to study the structural order in CaTiO_3 and $\text{Ca}_{1-x}\text{Sm}_x\text{TiO}_3$. Adviser: Prof. Dr. Elson Longo.

Alessandro de Souza Carneiro – Current localization and Joule effect in manganites with charge ordering. Adviser: Prof. Dr. Renato F. Jardim

Alexandre José de Castro Lanfredi – Production and characterization of YBCO-type superconductor materials of high critical temperature. Different dopings in the planes and chains will be used, for a study of the influence of dopants on the superconductive properties. With this purpose polycrystalline and single crystal samples are being produced with specific dopings. Adviser: Prof. Dr. Edson Roberto Leite.

Ana Paula de Azevedo Marques – Study of ceramic nanocomposites, of ABO_4 and/or ABO_4 type, in the form of crystalline and amorphous and nano-pss thin films. Different concentration gradients and different dopants will be studied. Adviser: Prof. Dr. Elson Longo.

André Luiz de Araujo – Works on the synthesis and characterization of ZnO-based and SnO_2 -based varistors. Works on refractory development and thermal conductivity studies. Industry-related advising works. Adviser: Prof. Dr. Elson Longo

César Antonio Oropesa Avellaneda - Thin films, ionic conductors, solar cells. Adviser: Prof. Dr. Edson Roberto Leite

Cledmar de Oliveira Silva – Scientific initiation. Preparation of ceramic components by slip casting. Adviser: Prof. Dr. Reginaldo Muccillo

Cristiane Vila – Synthesis of zirconia and niobia nanoparticles from peroxides. Zirconia (ZrO_2) and niobia (Nb_2O_5) are highly important oxides from the technological standpoint. Adviser: Prof. Dr. Edson Roberto Leite

Cristiano Morita Barrado – Study on the thermal stability of varistors. When a varistor is utilized in a lightning rod, it absorbs a huge amount of energy and its temperature increases. When the heat dissipation of these ceramic materials is not satisfactory, the temperature surpasses a critical limit and the lightning rod becomes thermally unstable, and the phenomenon of thermal avalanche can occur. Adviser: Prof. Dr. Edson Roberto Leite

Daniel Tamassia Minozzi – Development and characterization of nanostructured ceramic coatings to be used as protective linings against the carburization in the hydrocarbon pyrolysis tubes. Adviser: Prof. Dr. Elson Longo.

Danilo Augusto Bomfim – The student obtained the M. Sc. degree - Adviser Prof. Dr. João B. Baldo

Dawy Keyson de Almeida – Study of molybdates displaying photoluminescent properties. Adviser: Prof. Dr. José Arana Varela. Ph. D. defense: November 8, 2006

Derly Scomparin de Figueiredo – The student obtained the M. Sc. degree -Adviser Prof. Dr. João B. Baldo

Dimitri Chicaroni Fagundes Lima – Study of the influence of nanoparticle distribution on the performance of $\text{La}_{0.50}\text{Li}_{0.50}\text{TiO}_3$ -based cathodes. Adviser: Prof. Dr. Paulo Roberto Bueno

Diogo Paschoalini Volanti - SBN (strontium and bismuth niobate) ceramic materials present a potential applicability. Thus, the dielectric, ferroelectric and piezoelectric properties of SBN ceramic will be studied, utilizing the polymeric precursor method, which was based on the Pechini patent. Adviser: Prof. Dr. Elson Longo

Edevaldo Franco Neto – Completed Scientific initiation (Fellowship PIBIC/CNPq). Adviser Prof. Dr. Walter Libardi

Eduardo C. C. de Souza – Direct Ph. D.. Relationship between microstructure and properties in conductive ceramics prepared from nanoparticles. Adviser: Prof. Dr. Reginaldo Muccillo

Elaine Cristina Muniz – Construction and efficiency analysis of TiO_2 -based nanostructured solar cells. Adviser: Prof. Dr. Paulo Roberto Bueno

Elaine Cristina Paris - Establishment, in a simple way, of the basic concepts in nanotechnology using 3D animation and its diffusion by means of the television. Adviser: Prof. Dr. Elson Longo.

Eliel dos Santos - Scientific initiation. Research in electrical measurements of ceramics to be used in fuel cells. Adviser: Prof. Dr. Reginaldo Muccillo

Elisa Akiko Nakano Takahashi – Utilization of aluminum slag for the manufacture of expanded clay. Adviser: Prof. Dr. E. N. S. Muccillo

Emilene Laurentino Santos – Scientific initiation. Study of the densification of manganese-containing ceria. Adviser: Prof. Dr. Reginaldo Muccillo

Erica Caproni – Ph. D. student. Research in ceramics to be used as sensors. Adviser: Prof. Dr. Reginaldo Muccillo

Ernesto Govea-Alcaide – Intergranular properties of oxide superconductors. Adviser: Prof. Dr. Renato F. Jardim

Fabiana Villela da Motta – Synthesis and systematic study of the structural, microstructural, morphological, electrical and luminescent properties of thin films and ceramic powders based on barium-calcium titanate ($\text{Ba}_{1-x}\text{Ca}_x\text{TiO}_3$). Utilizing different calcium concentrations, it will be investigated the influence of Ca concentration on the Curie temperature, the tetragonality factor, the unit cell volume, as well as on the ferroelectric and dielectric properties of the $\text{Ba}_{1-x}\text{Ca}_x\text{TiO}_3$ system. The polymeric precursor method, based on the technique developed by Pechini, will be used as the synthesis process. Adviser: Prof. Dr. José Arana Varela.

Fábio Theodorovitz - Scientific initiation. Preparation, by a chemical method, of ceria-gadolinia solid electrolyte containing additives. Adviser: Prof. Dr. Reginaldo Muccillo

Flavio Leandro de Souza – Preparation and characterization of a nanocomposite-based silica polyester, a new hybrid ionic conductor. Adviser: Prof. Dr. Edson Roberto Leite. Ph. D. defense: August 25, 2006.

Francini Cristiani Picon – Study on the growth of ZnO, TiO₂ and SnO₂ nanoparticles. Adviser: Prof. Dr. Edson Roberto Leite.

Giovanni Pimenta Mambrini – Characterization of BaTiO₃ ferroelectric nanoislands synthesized by the polymeric precursor method. Adviser: Prof. Dr. Edson Roberto Leite.

Graziela C. T. da Silva - M. Sc. student. Effect of the addition of cobalt oxide on the sintering and the electrical conductivity of yttria-stabilized zirconia. Adviser: Prof. Dr. Reginaldo Muccillo

Graziela Pereira Casali – Analysis and study of the structural and morphological properties and the applications of ceramic pigments based on CeO₂ doped with praseodymium, nickel and cobalt. Adviser: Prof. Dr. Elson Longo.

Gustavo C. C. da Costa - Ph. D. student. Research on ceramics to be used in fuel cells. Adviser: Prof. Dr. Reginaldo Muccillo

José Antonio Souza – Study of the thermodynamic and electronic manganite properties. Adviser: Prof. Dr. Renato F. Jardim

José Britti Bacalhau – Completed Scientific Initiation (FAPESP fellowship). Adviser: Prof. Dr. João B. Baldo

José Fernando Queiruga Rey – Ph. D. student. Effect of the substitutions on the phase transitions and the electrical conductivity of Ba₂In₂O₅. Adviser: Prof. Dr. Reginaldo Muccillo

José Mário Ferreira Jr. - M. Sc. student. Research in thermistor ceramics. Adviser: Prof. Dr. Reginaldo Muccillo

Juliana Milanez – Study on ferroelectric materials of the PSCT/PSCZ system, both in the disordered and crystalline states. Both thin films and powders will be investigated, utilizing for the synthesis the polymeric precursor method. The thermal treatment will utilize conventional ovens, as well as microwave ovens. The influence of the microwave frequency on the properties of these new PSCT/PSCZ films will also be studied. Adviser: Prof. Dr. José Arana Varela.

Júlio César Sczancoski – Ferroelectric thin films based on strontium zirconate-titanate. Adviser: Prof. Dr. Elson Longo

Jurandir do Espírito Santo Silva Júnior –Completed the Scientific Initiation (PIBIC/CNPq fellowship). Adviser: Prof. Dr. João B. Baldo

Kírian Pimenta Lopes – Investigation of the formation and the properties of nanostructures based on tin dioxide (SnO₂). Adviser: Prof. Dr. Edson Roberto Leite.

Laécio Santos Cavalcante – Synthesis of thin films and powders of Ba(Zr_xTi_{1-x})O₃ (BZT), Ca(Zr_xTi_{1-x})O₃ (CZT), Mg(Zr_xTi_{1-x})O₃ (MZT) and (Zr_xTi_{1-x})O₃ (SZT), in which x=0.25, 0.50 and 0.75. Adviser: Prof. Dr. Elson Longo

Larissa Helena de Oliveira – Synthesis, characterization and catalytic studies of manganese porphyrins in zeolites. Our group utilizes manganese(III) tetrakis(4-N-Mepy)porphyrinate, which, due to its several properties, exerts the function of efficient, selective catalysts, with an easy recovery of reaction medium, when it is immobilized in an inorganic matrix such as zeolites X. Adviser: Prof. Dr. Ieda L. V. Rosa

Leilane Roberta Macario – Growth of tin oxide nanoribbons by means of the thermal evaporation of SnO. One-dimensional SnO nanoribbons will be produced by the thermal evaporation method, utilizing as the starting material SnO commercial powder. Adviser: Prof. Dr. Elson Longo

Liliane Aparecida de Carvalho – Application of the ac theory of porous electrodes for the investigation of electrocatalytic and photoelectrochemical devices. Adviser: Prof. Dr. Paulo Roberto Bueno

Luís Presley Serejo dos Santos – Synthesis strategies for the synthesis of lead-based niobates and perovskites. Adviser: Prof. Dr. Edson Roberto Leite. Ph. D. defense: *31/03/2006*

Luiz Ferreira de Lima Junior – Study of a methodology for the controlled synthesis of anisotropic ZnO nanoparticles from the hydrolysis of alcoxides. Adviser: Prof. Dr. Elson Longo

Luiz Gustavo Pagotto Simões - SnO₂-based varistors. SnO₂.TiO₂-based varistors. Sintering of NiO- doped SnO₂. Adviser: Prof. Dr. Elson Longo

Marcelo Zampieri – Study of La_{0.5}Sr_{0.5}CoO₃ (LSCO) thin films obtained by the polymeric precursor method as an electrode for the application of ferroelectric films. Adviser: Prof. Dr. Elson Longo

Márcio de Sousa Góes – Development of nanostructured electrodes for photoelectrochemical cells and Study by impedance spectroscopy and intensity of modulated photocurrent. Adviser: Prof. Dr. Paulo Roberto Bueno

Marco Aurélio Liuthevicene Cordeiro – Study of the correlation between electrical and microstructural properties of the SnO₂ varistor systems and Evaluation of natural active principles in hair fibers as photoprotective cosmetics. Adviser: Prof. Dr. Edson Roberto Leite

Marcos Anicete dos Santos – Quantum mechanical modeling of the photoluminescence of lead, barium, strontium and calcium tungstates. Adviser: Prof. Dr. Elson Longo

Marcos Vinicius Lopes de Oliveira – Completed Scientific Initiation (PIBIC/CNPq fellowship). Adviser: Prof. Dr. João B. Baldo

Maria Fernanda do Carmo Gurgel – Quantum mechanical method for the interpretation of materials properties. Adviser: Prof. Dr. Elson Longo.

Mario Godinho Junior – Synthesis and characterization of gadolinium-doped ceria and study of its interface with the NiO/CGO cermet anode. Adviser: Prof. Dr. Edson Roberto Leite.

Mário Lúcio Moreira – Study on the photoluminescence and electrical properties of ordered and disordered titanate thin films. Adviser: Prof. Dr. Elson Longo

Mario Roberto Barro – 3D animations performed by means of graphical computing for the presentation of the projects developed at LIEC. Adviser: Prof. Dr. Elson Longo

Mauricio Roberto Bomio Delmonte - Ferrites as an anode material for lithium batteries. Adviser: Prof. Dr. Elson Longo

Miguel Ángel Ramírez Gil – Study on the degradation of SnO₂-based varistors. Adviser: Prof. Dr. Paulo Roberto Bueno

Monica Aparecida dos Santos – Electrical and microstructural study of SnO₂.CoO-based and SnO₂.MnO-based polycrystalline systems. Adviser: Prof. Dr. Paulo Roberto Bueno

Naira Canevarolo Pesquero – Structural properties of Li_xCoO_2 prepared at low and high temperatures and its influence on load/unload electrochemical performance. Adviser: Prof. Dr. Paulo Roberto Bueno

Olavo Rodrigues de Oliveira – Research on fuel cells operating with methane. Adviser: Prof. Dr. Reginaldo Muccillo

Pedro Henrique Lima Blanco - Scientific initiation. Synthesis of solid solutions by the cation complexation method. Adviser: Prof. Dr. Reginaldo Muccillo

Poty Rodrigues Lucena – Evaluation of optical and electronic properties of selected superstructures. Adviser: Prof. Dr. Elson Longo

Rafael Libanori – Study of the photoactivated electronic transfer in Y_2O_3 -encapsulated TiO_2 nanoparticles. Adviser: Prof. Dr. Edson Roberto Leite

Rafael Luiz Erlo – Theoretical study of the structural order and disorder in perovskites. Adviser: Prof. Dr. Elson Longo

Rafael Morgado Batista - Scientific initiation. Preparation and electrical conductivity of lanthanum gallate. Adviser: Prof. Dr. Reginaldo Muccillo

Rafael Oliveira da Silva – Development of an empirical model of phase transitions in $\text{Pb}_{1-x}\text{Ca}_x\text{TiO}_3$ solid solutions. The peak intensities of the solid solution diffraction patterns, taking into account the structure factors, will be utilized. Adviser: Prof. Dr. Elson Longo

Renata Cristina Lima – Ceramic pigments obtained by the polymeric precursor method. Adviser: Prof. Dr. Elson Longo. Ph. D. defense: November 8, 2006

Renata de O. Bressane - Scientific initiation. Research in porous ceramics to be used as fuel cell anodes. Adviser: Prof. Dr. Reginaldo Muccillo

Sérgio Henrique B. de Sousa Leal – Preparation and characterization of lead-strontium titanate powders and thin films obtained by a chemical method. Adviser: Prof. Dr. Ph. D. defense: July 3, 2006.

Sergio Ricardo de Lazaro – Semiconductors from the perovskite (ABO_3) family are widely utilized as raw materials for computer memories, sensors and electro-optical devices. Adviser: Prof. Dr. Elson Longo. Ph. D. defense: September 15, 2006

Shirley L. dos Reis - Scientific initiation. Study of solid solution formation in ceria-gadolinia. Adviser: Prof. Dr. Reginaldo Muccillo

Solange de Andrade - Metal-insulator transition in nickelates in the presence of hydrostatic pressure. Adviser: Prof. Dr. Renato F. Jardim

Sueli Hatsumi Masunaga – Preparation and characterization of $(\text{La},\text{Pr})\text{CaMnO}$ manganites. Adviser: Prof. Dr. Renato F. Jardim

Tania Regina Giraldo – Preparation of SnO_2 films from a colloidal suspension. Adviser: Prof. Dr. José Arana Varela

Vagner Bernal Barbeto – Thermoelectric power in the presence of magnetic fields in nickelates. Adviser: Prof. Dr. Renato F. Jardim

Valéria Moraes Longo – Disordered materials with room temperature photoluminescence. The need of obtaining materials displaying tunable light emission increases day by day with the growing technological development. Adviser: Prof. Dr. Elson Longo

Viviane Cristina Albarici – Synthesis and characterization of $\text{PbZr}_{1-x}\text{Ti}_x\text{O}_3$ (PZT, $0 \leq x \leq 1$) ferroelectric nanoislands. $\text{PbZr}_{1-x}\text{Ti}_x\text{O}_3$ (PZT, $0 \leq x \leq 1$) is one of the most studied ferroelectric materials. The reason is because these oxides present a high spontaneous polarization and a large temperature range in which the ferroelectric phase is stable. Adviser: Prof. Dr. Edson Roberto Leite

Willian Campos Ribeiro – Study of the correlation between dielectric and non-ohmic properties in $(\text{Ca}_{1/4}, \text{Cu}_{3/4})\text{TiO}_3$ -type polycrystalline ceramic systems. Adviser: Prof. Dr. Paulo Roberto Bueno

Attach 7

**participation in
national and international congresses
and conferences**

1. UNESP, Bauru Palestra "Nanotecnologia versus Ciência da Nanotecnologia" 26 e 27/10. Elson Longo
2. Presidente de Mesa na II Olimpíada de Matemática, Química e Física, 02/09, IFSC-USP. Elson Longo
3. Participação na Abertura do IV Simpósio Eng. Física 30/08, DF-UFSCar. Elson Longo
4. Conferência no Instituto de Educação, São Carlos. 17/11. Elson Longo
5. Conferência na Colômbia e Equador, de 20 a 25/12. Elson Longo
6. Mini-Curso na UFCG, "Nanotecnologia a Ciência do Futuro" de 12 a 15/12. Elson Longo
7. *Admittance and Dielectric Spectroscopy of Polycrystalline Semiconductors, invited conference in the Electroceramics X, Toledo, Espanha, 2006.* Paulo Bueno
8. Espectroscopia de Impedância (Elétrica e "Óptica") Aplicada en la Analisis de Dispositivos de Estado Sólido y Electroquímicos, INTEMA, Mar del Plata, Argentina, 2006. Paulo Bueno
9. Frequency Response Techniques - Applications in Alternative Energy Devices, Instituto de Química, UNICAMP, Campinas, 2006. Paulo Bueno
10. *Admittance and Dielectric Spectroscopy of Polycrystalline Semiconductors, Instituto de Química, UNESP, Araraquara, 2006.* Paulo Bueno
11. "Supercondutividade" Renato Jardim
Universidade Federal do Espírito Santo - Maio de 2005, Renato Jardim
12. "Supercondutividade em metais e óxidos" Renato Jardim
13. "Supercondutividade" Instituto de Física Teórica, Novembro de 2006, Renato Jardim

1. Giovanni Pimenta Mambrini, Elson Longo, José Arana Varela, Edson Roberto Leite "TiO₂ colloidal nanocrystals synthesized by solvothermal method", V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (B507).
2. Francini Cristiani Picon, Marcos Anicete Santos, Luiz Ferreira de Lima Junior, Marcia Escotte, Paulo Sérgio Pizani, José Arana Varela, Elson Longo "Room-temperature photoluminescence in structurally disordered SrWO₄", V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (D512).
3. Vicente Borges Marques, Mario Cilense, Paulo Roberto Bueno, José Arana Varela, Elson Longo da Silva "Nature of Potential Barrier in (Ca_{1/4} Cu_{3/4}) TiO₃ Polycrystalline Perovskite", V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (E512).
4. Erica Caproni, Reginaldo Muccillo "Development and Characterization of Zirconia-yttria/zirconia-magnesia Composites for Disposable High Temperature Oxygen Sensors" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H510).
5. Débora Lima Pontes, Fenelon Lima Pontes, Edson Roberto Leite, José Arana Varela, Paulo Sérgio Pizani, Adenilson José Chiquito, Marcos Antônio Machado, Elson Longo "A Raman and dielectric study of diffuse phase transition in (Pb_{1-x}Ca_x)TiO₃ thin films", V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H514).
6. Gustavo Carneiro Cardoso Costa, Reginaldo Muccillo "Scandia-stabilized zirconia (ScSZ) obtained by the polyacrilamide technique" ", V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H515).
7. Juliana Milanez, Valéria M. Longo, Alberthmeire T. de Figueiredo, Fábio S. de Vicente, Antônio C. Hernandez, Elson Longo, José Arana Varela "Blue luminescence emission from structurally disordered CaTiO₃", ", V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (D578).
8. Fábio C. Fonseca, Daniel Z. de Florio, Eliana N.S. Muccillo, Reginaldo Muccillo "Fabrication and testing of solid oxide fuel cells", V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H520).
9. Adaci Batista Campos, José Waldo Espinosa, Maria Teresa Fabbro, Myriam Rincon Joya, Iedo Alves de Souza, Elson Longo, José Arana Varela "Photoluminescence of Ca(MoW)O₄ thin films", V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (D532).
10. Rafael Libanori, Caue Ribeiro, Tânia Regina Girdali, José Arana Varela, Elson Longo, Edson Roberto Leite "Study of the photoactivated electronic transference from Rhodamine B to TiO₂ – Al₂O₃ encapsulated nanoparticles" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (D533).
11. Luiz Ferreira de Lima Jr, Laécio Santos Cavalcante, Iedo Alves de Souza, Sérgio Cava, Elson Longo, José Arana Varela "Dielectric properties of CZT thin films prepared by chemical solution deposition", V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H525).

12. Rafael Oliveira da Silva, Poty Rodrigues de Lucena, Edson Roberto Leite, José Arana Varela, Elson Longo "Development of empirical model of compositional phase transition in ferroelectric (Pb,Ca)TiO₃ solid solution", V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (B537).
13. Laécio Santos Cavalcante, Ana Paula Azevedo Marques, Alberthmeiry Teixeira Figueiredo, Valéria Moraes Longo, Sérgio Ricardo Lázaro, Fábio Simões Vicente, Antonio Carlos Hernandez, Ieda Lúcia Viana Rosa, Elson Longo "Effect of structural disorder on the intense photoluminescence of perovskite BZT" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H546).
14. André S. Ferlauto, Daniel Z. de Florio, Fábio C. Fonseca, Vincenzo Esposito, Reginaldo Muccillo, Enrico Traversa, Luiz O. Ladeira "Composites of Nickel, Zirconia and Carbon Nanotubes" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H529).
15. Reginaldo Muccillo, Eliana Navarro dos Santos Muccillo, Daniel Zanetti de Florio, José Arana Varela "Analysis of sintering zirconia-yttria ceramics by impedance spectroscopy" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H536).
16. Viviane Cristina Albarici, Marcia Tsuyama Escote, Elson Longo, José Arana Varela, Edson Roberto Leite "A new chemical route to obtain nanometric oxide grains" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H539).
17. Francini Pizzinato Kataoka, Júlio César Ossugui, Cristiano Morita Barrado, Elson Longo, Lucídio Souza Santos, Mário Sérgio Galhiane, Felon Lima Pontes "Synthesis by MPP and Ti(IV) isopropoxide of anatase TiO₂ nanocrystals under a hydrothermal condition" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (F520).
18. Yone Vidotto França, Odília Cordeiro Ribeiro, José Mário Ferreira Jr, Eliana Navarro dos Santos Muccillo, Reginaldo Muccillo "Synthesis and electrical characterization of ceramic thermistors based on manganese, nickel and cobalt oxides" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H541).
19. Valéria Moraes Longo, Maria Graça Costa, Alberthmeiry Teixeira Figueiredo, Fábio de Vicente, Elson Longo, Antonio Carlos Hernandez, José Arana Varela "Intense blue photoluminescence in structurally disordered SrTiO₃: Sm" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (N535).
20. Larissa Roveroni Moraes, Poty Rodrigues de Lucena, Edson Roberto Leite, José Arana Varela, Elson Longo "Texturized NaNbO₃ thin films obtained by polymeric precursor" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H577).
21. Margarete Soares Silva, Mário Cilense, Márcio Souza Góes, Elson Longo, Maria Aparecida Zaghete, Carlos Oliveira Paiva Santos, José Arana Varela "Study of piezoelectric properties in calcium-doped PZT" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H552).

22. Fábio C. Fonseca, José A. Souza, Eliana N.S. Muccillo, Reginaldo Muccillo, Renato F. Jardim "ac and dc magnetotransport properties of the phase-separated $\text{La}_{0.6}\text{Y}_{0.1}\text{Ca}_{0.3}\text{MnO}_3$ manganite" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H554).
23. Ana Paula de Azevedo Marques, Dulce Maria Melo, Edson Roberto Leite, Paulo S. Pizani, Elson Longo "Nanopowders SrMoO_4 prepared by Complex Polymerization Method: microstructural and optical characterization" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (D568).
24. Fabiana Vilela Motta, Ana Paula de Azevedo Marques, Márcia Tsuyama Escote, Dulce Maria Melo, Edson Roberto Leite, Elson Longo, José Arana Varela "Improvement of dielectric properties of $\text{Ba}_{0.8}\text{Ca}_{0.2}\text{TiO}_3$ films" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H557).
25. Ieda Lúcia Rosa, Ana Paula de Azevedo Marques, Marcos T. Tanaka, Dulce Maria Melo, Edson Roberto Leite, Elson Longo "Study of the luminescent properties of Eu^{3+} doped Barium Molybdate" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (D569).
26. Mário Lúcio Moreira, Elson Longo, Francini Cristiani Picon, Marcelo Zampieri, Rorivaldo Camargo, Sidnei Antônio Pianaro "Electrical and Microstructural Properties of SnO_2 Doped Varitors" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H559).
27. Valdemir dos Santos, José Milton Matos, Elson Longo, Edson Roberto Leite "Influence of heating rate in the transformation of phase to ZrO_2 " V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (B566).
28. Ederson Carlos Aguiar, Alexandre Zirpoli Simões, José Arana Varela "Characterization of pure and niobium doped $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ " V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H560).
29. Fagner Ticiano G. Vieira, Raphael A. Sousa Mendes, Harley Farias Dantas, Severino J. Guedes de Lima, Wilson Silva Jr, Carlos Alberto Paskocimas, Elson Longo, Antonio Gouveia de Souza, Ieda M. Garcia Santos "Pigments of $\text{TiO}_2\text{:Cr, Sb}$ obtained by different synthesis methods" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (B568).
30. Alexandre Zirpoli Simões, Ederson Carlos Aguiar, José Arana Varela, Elson Longo da Silva "Electromechanical properties of calcium bismuth titanate films: a potential candidate for lead-free thin-film piezoelectrics" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H561).
31. Eduardo Caetano Souza, Reginaldo Muccillo, Eliana Navarro Muccillo "Synthesis and characterization of Sm_2O_3 nanoparticles" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (B569).
32. Mary C. Ferreira Alves, Soraia C. Carvalho de Souza, Marcelo Rogrigues Nascimento, Herbert H. de Sousa Lima, Severino J. Guedes Lima, Elson Longo, Antonio Gouveia de Souza, Ieda M. Garcia dos Santos "Influence of Sr^{2+} addition on the properties of Ca^{1-}

$x\text{SnO}_3$, synthesized by the polymeric precursor method" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (B570).

33. Ederson Miranda Santos, Miguel Angel Ramirez, Paulo Robero Bueno, Maria Aparecida Zaguete, José Arana Varela "Influence of the TiO_2 on the size and morphology of powder particle and grain of SnO_2 - based varistor ceramic system" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (H568).
34. Renata F.L. Silva, Sayonara A. Eliziário, Severino J.G. Lima, Luiz E.B. Soledade, Carlos A. Paskocimas, Elson Longo, Antônio Gouveia de Souza, Ieda M.G. Santos "Structural and colorimetric study of iron titanate obtained in different atmospheres" V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (B621).
35. Soraia Carvalho de Souza, Herbert H. de Sousa Lima, Mary C. Ferreira Alves, Luiz E. Bastos Soledade, Severino J. Guedes Lima, Elson Longo, Carlos Alberto Paskocimas, Antônio Gouveia de Souza, Ieda M. Garcia dos Santos "Properties of $\text{BaTiO}_3:\text{Pr}$ synthesized by the polymeric precursor method" " V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (B589).
36. Herbert H. de Souza Lima, Soraia Carvalho de Souza, Carlos C. Lima Santos, Mary C. Ferreira Alves, Marcia R. Santos Silva, Luiz E. Bastos Soledade, Elson Longo, Antônio Gouveia de Souza, Ieda M. Garcia dos Santos "Influence of synthesis conditions on the properties of Zn_2TiO_4 " V Encontro da Sociedade Brasileira de Pesquisa em Materiais, de 08 a 12 de outubro de 2006 (B595).
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