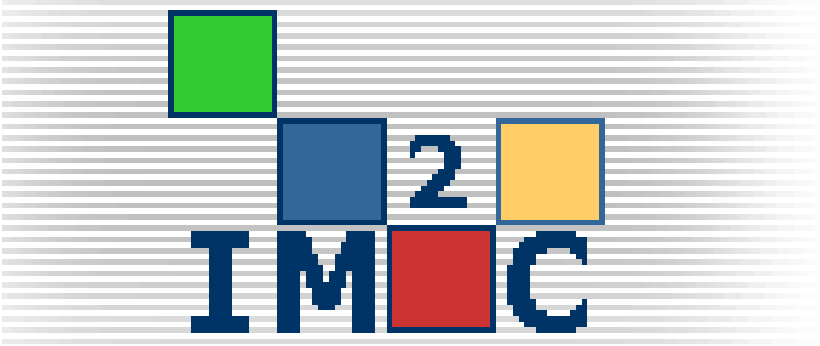

Millenium Institute for Complex Materials

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Participating universities:
UFPe, UFRJ, Unicamp, USP

Relevance for the advancement of knowledge and understanding

Cutting-edge research topics and tools

- Complex functional and structural new materials
  - nanocomposites, materials for NLO, oxide nanotubes, molecular electronics, specialty resins (adhesives)
- Powerful analytical tools
  - Maldi-TOF, many SPMs, analytical microscopy, NIR
- Powerful theoretical, modeling and pattern-finding tools for molecules and solids
  - ab-initio and semi-empirical methods, chemometrics
- Model systems
  - gas-phase reactions, laser and electron-induced desorption techniques

Innovative concepts

- Pervasive concepts from Complexity
- From nano to macro
  - microchemical information used to understand materials properties and to find potencialities
- Increasing value of Brazilian raw materials
  - *green* products and processes
- Establishing new patterns for interaction between academy and industry
  - decreasing gaps from the lab to the plant
  - lessons from the National Conference on S&T

Overall assessment

- Proposed targets were exceeded:
  - Papers: 191 (180)
  - Patents: 15 (9)
- Qualitative progress
  - Publication in top-ranking journals
- Strong interaction with industrial companies
  - Additional funding (*e.g.* Fundo Verde-Amarelo, Fapesp PIPE)

Impact on teaching, training, learning

- Course upgrading, new graduate and undergraduate regular courses in participating universities.
  - Microscopy, nanotechnology, chemical technology
- Short courses throughout the country
  - for undergraduates, teacher in-service training
- Specialist courses
  - for members and non-members
- Book publication
  - Nina Hall, “New Chemistry” (translation); H. Toma, “O mundo nanométrico”

Impacts on infra-structure

- A powerful imaging network
  - **5 SPMs, 2 SEMs (1 EDS), 1 TEM (ESI)**
    - **Cryoultramicrotome, thin film coating**
  - **X-Ray microtomograph**
    - **3D imaging**
  - **X-Ray fluorescence microspectrometer**
    - **Multicapillary optics**
- Mass spec for particles and polymers
  - **Laser, electron-impact assisted**
- Computational methods
- Chemometrically-assisted spectroscopy and scattering
- MS and ICR for gas-phase reactions
- Also: standard equipment renewal
  - TA, IR, fluorescence, Raman

Propagation of results

- Towards applications:
  - R&D projects with industrial companies
    - Oxiteno, Crylor, Carol, Rhodia-Ster, Rhodia-Química, 3M, EF, Helios-Carbex, Bunge
  - Support to quality systems
    - Votorantim, Libbs Farma
  - Consulting

- Towards the public
  - LQES Portal and Bulletin
    - 66 issues, 120.000 hits, 470 subscribers
    - Abstract in the Abifina Bulletin
  - Seminars, lectures and other activities within regular events (ABC, SBPC, SBQ, ABEQ…)

Strenghtening of the involved institutions

- Equipments acquired for all participating institutions
  - Open access, whenever possible
  - LV SEM used by students from more than 35 groups (25 from IQ-Unicamp), totalling so far 312 instrument sessions
- Increased research output
  - *participation from associated junior researchers*

Enhancement of national and international cooperation

- Increasing collaboration with authors from different groups
- Increasing collaboration with authors from different universities, beyond the Institute
- Increasing collaboration with authors from other countries
  - Department of Porous Materials and Intercalation Compounds of the Institute of Materials Science of Madrid (CSIC, Spain) registered as an associated laboratory

Impacts in productive chains

- Collaborative projects with industrial and R&D&E companies
- Studies performed for CGEE
  - Nanotechnology strategies from companies
  - Opportunities in nanotechnology: polymer nanocomposites and nanopharmaceuticals
- Recent PhDs and MScs being hired by industrial companies
  - 3M, Rhodia, Resana/Reichhold, rubber producers

Main contributions: competitiveness and social-economic

- Adding value to natural rubber
  - Nanocomposites, latex processing, latex products: high-tech products from the plantation and the forest
- Ionic modification of polymers
  - Changing a paradigm in product development
- Industrial product diversification
  - Products for different applications out of the same raw materials, same plant
- PAN for making carbon fiber
  - Embraer, CTMSP
- Coordination of the Virtual Institute of Catalysis in Rio
- Environmental sensors

Interdisciplinary cooperation

- Cross-fertilization using results from different institutions
  - A new hypothesis for the nature of charge carriers in electrified insulators, based on gas-phase ion clusters: an open problem, since Thales of Miletus
- Within institutions, very different areas
  - Widespread use of MS in medicine, toxicology, environment