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# Applied Mineralogy

Developments in Science and Technology

Edited by

Marcelo Pecchio

*Brazilian Portland Cement Association (ABCP)*

Fábio Ramos Dias de Andrade

*University of São Paulo, Geosciences Institute, Department of Mineralogy and Geotectonics*

Liz Zanchetta D'Agostino

*University of São Paulo, Polytechnic School, Department of Mining and Petroleum Engineering*

Henrique Kahn

*University of São Paulo, Polytechnic School, Department of Mining and Petroleum Engineering*

Lilia Mascarenhas Sant'Agostino

*University of São Paulo, Geosciences Institute, Department of Sedimentary and Applied Geology*

Maria Manuella Maia Lê Tassinari

*University of São Paulo, Polytechnic School, Department of Mining and Petroleum Engineering*

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International Council for Applied Mineralogy do Brasil, ICAM-BR

Despite other parallel international conferences that reduced the attendance in some sessions such as Mineral Exploration, Ore Mineralogy, and Environmental Mineralogy, the submission of 378 Abstracts which resulted in 249 papers accepted for oral and poster presentations, with delegates coming from no less than 35 countries of the five continents, is a result of the firm importance of applied mineralogy in our lives and the strength of ICAM conferences in the international community.

Nevertheless, ICAM 2004 would not have been possible without the firm dedication and enthusiasm of many people, in particular ICAM 2004's organizing and scientific committees consisting of Lília Mascarenhas Sant'Agostino, vice chair; Marcelo Pecchio, scientific committee chair; Fábio Ramos Dias de Andrade, scientific committee vice-chair; Maria Mannela Maia Lê Tassinari, 1<sup>st</sup> secretary; Liz Zanchetta D'Agostino, 2<sup>nd</sup> secretary, as well as all the members of the Scientific Committee and Vanilda Queiroz Sganzerla and her team from Joy Eventos e Promoções.

The high standard of this two-volume publication could not have been achieved without the efforts of the authors to prepare their manuscripts, the reviewed by members of the Scientific Committee and the Advisory Board, and the final editing of Liz Zanchetta D'Agostino and Miguel de Oliveira and his team from Diagrama Estudio de Artes Gráficas.

Henrique Kahn, São Paulo  
ICAM 2004 Chairperson



## Organization

### ICAM 2004 is organized by:

International Council for Applied Mineralogy, ICAM  
International Mineralogical Association - Commission on Applied Mineralogy, IMA-CAM  
University of São Paulo, Polytechnic School  
University of São Paulo, Geosciences Institute  
International Council for Applied Mineralogy do Brasil, ICAM-BR

### Sponsorship



### Partnership

Brazilian Ceramics Association (ABC)  
Brazilian Metallurgy and Materials Metallurgical Association (ABM)  
Brazilian Geological Society (SBG)  
Brazilian Mining Institute (IBRAM)  
Revista Minérios e Minerais  
International Association on the Genesis of Ore Deposits co-sponsored Mineral Exploration and Ore Mineralogy sessions  
CIM - Canadian Institute of Mining, Metallurgy and Petroleum co-sponsored Environmental Mineralogy a Health session  
International Mineralogical Association - Commission on Ore Mineralogy co-sponsored Ore Mineralogy a Process Mineralogy sessions

## Editorial

Applied mineralogy embraces numerous applications of mineralogy in the mineral, metallurgical, chemical, and materials industries, as well as in waste recycling and environmental assessment and monitoring. As an interdisciplinary field, it involves characterization of a wide variety of ores, mineral concentrates, engineered materials, industrial residues, and also data interpretation regarding the industrial processes, products, and environmental regulations. The content of these two volumes covering the 13 session headings of the conference reflects the highly interdisciplinary meaning of the applied mineralogy moving towards a materials science approach.

Since the first "International Congress on Applied Mineralogy" (ICAM 1981), in South Africa, it has been an internationally recognized forum that works to bring together researchers from industry, research organizations and academia working in the field of applied mineralogy.

This Congress is considered the main scientific event of the "International Council for Applied Mineralogy", a loose organization founded to serve the needs of applied mineralogists by providing a board for international activities. Until 1993 the Congresses were held at irregular intervals; after that with co-sponsoring of the International Mineralogical Association (IMA) and its Commission on Applied Mineralogy, it was established a regular 4-year interval and the Congress became more highly interdisciplinary. Previous meetings were held in Johannesburg (1981), Los Angeles (1984), Montreal (1989), Pretoria (1991), Perth (1993), Warsaw (1996), and Göttingen (2000).

ICAM 2004 was organized by University of São Paulo through Polytechnic School and Geosciences Institute, and the International Council for Applied Mineralogy do Brasil (ICAM-BR) in addition to ICAM and IMA-CAM and with a partnership of Brazilian Geological Society (SBG), Brazilian Ceramics Association (ABC), Brazilian Metallurgy and Materials Association (ABM), Brazilian Mining Institute (IBRAM), and Revista Minérios e Minerais. Some particular sessions were also co-sponsored by other international associations: Mineral Exploration and Ore Mineralogy sessions by the International Association on the Genesis of Ore Deposits (IAGOD), Environmental Mineralogy and Health by the Canadian Institute of Mining, Metallurgy and Petroleum (CIM), and Ore Mineralogy and Process Mineralogy sessions by the International Mineralogical Association - Commission on Ore Mineralogy (IMA-COM). Sponsorship from many Brazilian funding agencies, analytical instruments, and mineral and oil industry related companies was crucial to achieve the success of the conference.

Brazil was chosen by the International Council for Applied Mineralogy to hold a conference due to its significance in the world mineral industry, next of ICAM conferences, and to promote a higher integration with other Latin American countries. The Congress brought a unique integration opportunity for applied mineralogists to present their latest research results and an open discussion of the current state-of-the-art stimulating their own enhancement and also the development of new technologies and products and winning productivity into the several application fields.

