

The workshop “Rare Earth: Brazilian Scenario, Basic Research and Opportunities” was integrated into the series of Strategic Workshops offered by *Pró-Reitoria de Pesquisa* and was held at the USP Agency for Innovation on June 29, 2016. This initiative created a space for fruitful discussions on themes that are fundamental for both Brazilian and global science and technology. The participants were honored with the presence of the Pro-Rector of Research of the University of São Paulo José Eduardo Krieger, the director of the Institute of Advanced Studies (IEA) Paulo Saldiva, and the president of the Academy of Sciences of the State of São Paulo Marcos Buckeridge during the opening of the event. The debates were distributed into three sections, and researchers from the University of São Paulo and from other Brazilian institutions participated in them. The participation of researchers from different Institutions was expressive, and discussions concerning common problems related to plural and multidisciplinary research into Rare Earth were relevant and intense. The participation of researchers from the Polytechnic School, IPEN, IPT, and CETEM; of a member of the Brazilian-German Chamber of Commerce and Industry; and of researchers in the fields of Chemistry and Physics from USP and UNESP greatly contributed to the debate. The event counted on real-time transmission over the Internet, which allowed for its viewing by over 400 viewers. The first section presented the Brazilian scenario: from extraction of Rare Earth compounds to basic research and innovation. The second section focused on Basic Science: synthesis and properties. The third section dealt with Applied Science.

The highlight of the first section was the outline of the Brazilian scenario concerning exploration and mining, basic research, applied science, and innovative aspects involving Rare Earth compounds. Every historical aspect of the Brazilian technology for the extraction and separation of Rare Earth compounds was clearly presented by Prof. Osvaldo Serra in his brilliant opening lecture. The first section provided a current overview that pointed out and intensely debated the most recent initiatives on the mining of Rare Earth compounds, including the scientific-technological and innovation challenges as well as the issues related to sustainable processes. This section also described the main initiatives on the part of private companies and the federal government to resume the extraction and separation of Rare Earth compounds. The significant participation of researchers from diverse areas generated an interesting and fundamental discussion about the mentioned aspects. The participation of researchers

with great experience in the area of applied science and innovation culminated in an interesting debate on Innovation, Patents, and Challenges within our Brazilian scenario.

Undoubtedly, all the aspects that were raised and discussed during this first section together with the diversified points of view were fundamental to guide future projects and to permeate joint actions and efforts by the university in collaboration with the Federal government and private companies. All these aspects were then intensely discussed in the two sections that followed, when basic and applied science gave room to discussions about technology and innovation. The main points for reflection were demands and the Brazilian scenario, laws of innovation, academia-industry interaction, and challenges to be faced through applied science and innovation. Another highlight of the event was the analysis of the importance of the international recognition gained by the Brazilian scientific community working with Rare Earth compounds, including contribution to the training of human resources and to the excellence of scientific development.

An important concrete analysis of the Brazilian scenario concerning the exploration and separation of Rare Earth compounds was made by Prof. Hugo (EEL-USP), who described his relevant experience with the Niobium project developed together with CBMM, the same company that has now initiated the treatment of waste generated during the mining of niobium with a view to extracting and separating Rare Earth compounds.

As perspectives, we must mention that some initiatives started at the workshop have already provided extraordinary results. A significant number of researchers attended the 7<sup>th</sup> National Rare Earth Meeting, held in Águas de Lindóia in September 2016 and organized by Prof. Sidney José Lima Ribeiro (chair) and Prof. Rogéria Rocha Gonçalves (co-chair). Huge participation of the Brazilian Rare Earth community is expected at the ICL-International Conference on Luminescence, which will be held in the Southern Hemisphere for the first time. Scientific activities in collaboration with an effective national network are other concrete perspectives that will count on the

participation of the majority of the researchers invited for this workshop in newly approved INCTs. In addition, virtual dissemination of this event has resulted in a mineral cooperative contacting us to express their intention to establish a bridge between the academy and mining companies aiming to propose strategies to tackle the issues pointed out in the discussions.

A forum involving participants from the private sector that are interested in technological processes for the extraction of Rare Earth compounds would be essential. Participation of the Federal government, CETEM, and FINEP/BNDES, which today have programs to support research into Rare Earth compounds, and of researchers interested in extracting and separating such compounds is also desirable.

A debate in applied science in Photonics and Biophotonics, with more specific discussions concerning strategic areas such as Health, Environment, Energy, and Telecommunications will be organized at the Department of Chemistry (USP, Ribeirão Preto campus) in 2017 and will involve national and international researchers.

The initiative reported herein provided an excellent forum for the discussion and the establishment of future actions in collaboration with private and state institutions.