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EUROPEAN RARE-EARTH AND ACTINIDE SOCIETY

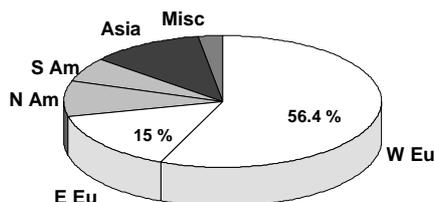
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August 31, 1999

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EDITORIAL

The European Rare Earth and Actinide Society has started its tenth year of operation. One interesting characteristic is the steady increase in membership, especially after the Paris conference (ICFE-3). Presently, 367 members are affiliated to the association, belonging to 39 different countries. A majority of the members are residing in Western and Eastern Europe (71.4 %), while 14.7 % are from the Americas and 11.4 % from Asia and India. We thank all of them for their support. On the other hand, we have lost most of our industrial corporate members, mainly in view of the difficult economical situation they are experiencing.



The main goals of the Executive Committee for this year are (i) to help with the setting up of the fourth International Conference on f-Elements, to be held in Madrid, September 17-21, 2000, and (ii) to launch the procedure for granting the first ERES awards to a young rare-earth scientist, as decided during the last general meeting held in Paris, and to a well established scientist. A call for nominees will appear in

the next issue of this Newsletter.

INDUSTRY

Clean Diesel engines thanks to EOLYS™

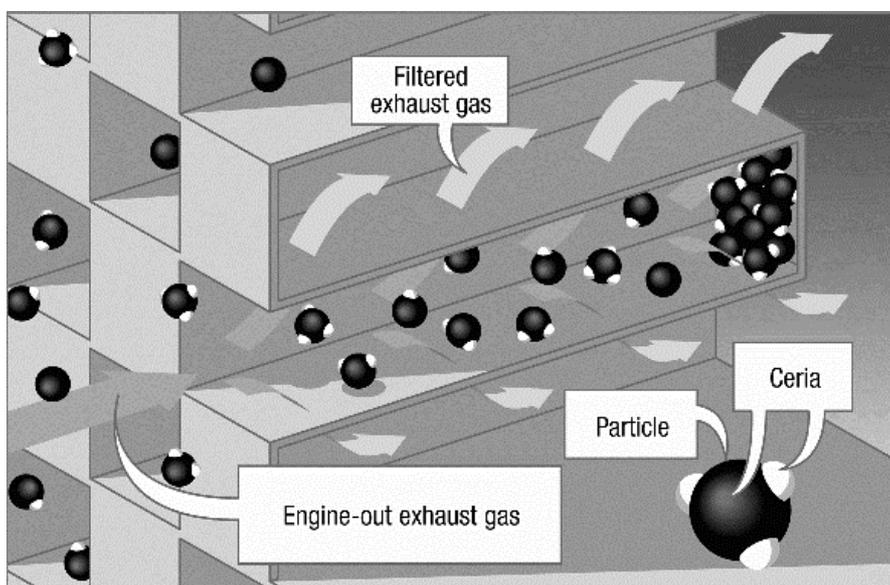
Rhodia, the French leader in chemical specialties, with a turnover of 36 billion French francs (1998) and more than 23 500 employees worldwide, has come up with a breakthrough. It recently marketed a new catalyst for Diesel engines, EOLYS™, which has been approved by the German and Swiss Environmental Agencies and which has been favorably considered by the French Ministry for the Environment.

The novel technology has been adopted by the French car maker PSA Peugeot Citroen for its new generation of Diesel cars. The EOLYS™ catalyst is soluble in

diesel and combined with a filter it leads to a reduction of the particles emitted by Diesel engines of more than 99%, including the health-hazardous ultra fine particles. The emission level is lower than the regulations to be enforced in United States of America in 2004 and in Europe in 2005, giving a definite technological edge to Rhodia in this matter and opening large markets to the French company.

As shown below in this figure provided by Rhodia Terres Rares, the action of the catalyst relies on fine cerium oxide particles which agglomerate with the soot particle, allowing their easy elimination by the filter. The Eolys™ catalyst is put into a special reservoir and then mixed with the diesel through a dedicated line.

Swedish Contributions to



the Discovery of f-Elements

Part 2 : The Work of Berzelius

Lauri Niinistö

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Jacob Berzelius (1779-1848) represented the highest chemical authority during the first half of the nineteenth century. His achievements include the development of chemical analysis and laboratory techniques, determination of accurate atomic weights and introduction of modern chemical symbols. Berzelius also discovered a number of new elements, among them the f-elements cerium and thorium.

Jöns Jacob Berzelius grew up under poor and insecure conditions, because his parents died before he had reached the age of ten. He was able to complete his medical studies in 1802 at the University of Uppsala, thanks to the help of a scholarship. It is during these studies that Berzelius became increasingly interested in chemistry. He was only twenty-eight year old when he got an early appointment as a full professor of chemistry at the School of Surgery in Stockholm. However, a major part of his work was carried out when he was acting as permanent secretary of the Royal Swedish Academy of Sciences, where he was also responsible for writing the influential Annual Reports on the progress of chemistry, physics and mineralogy.

The Discovery of Cerium

One of the founders of modern mineralogy, A. F. Cronstedt (1722-1765) had discovered in Bastnäs in 1751 an unusually heavy, black mineral which he called *tungsten* (heavy stone) of Bastnäs. The famous chemist Carl Wilhelm Scheele (1742-1786) analyzed it and came to the conclusion that it was only an iron

was more or less forgotten for two decades.

The discovery of yttrium by Johan Gadolin in 1794 from the tungsten of Ytterby prompted in spring 1803 the ironmaster Wilhelm Hisinger together with the young Berzelius to reinvestigate the tungsten from Bastnäs for



Jac. Berzelius.

Figure : Jöns Jacob Berzelius (1779-1848) liked to be portrayed in front of his analytical balance which was instrumental in carrying out accurate chemical analyses and determining atomic weights.

aluminum silicate and the mineral a possible presence of yttrium.

The investigation continued in Stockholm during the winter 1803-4 and resulted in the discovery of cerium which was named after the new asteroid *Ceres*. The report was sent to A. F. Gehlen in Germany to be published in his *Neues Allgemeines Journal der Chemie*. In order to establish priority, it was also printed in Swedish as a small pamphlet issued in only 50 copies, which are now of extreme rarity.

Independently of Hisinger and Berzelius, the skilled mineral analyst M. H. Klaproth (1743- 1817) working in Berlin had also analyzed a sample of cerite mineral as the tungsten of Bastnäs was now called and the new element did not escape from his experienced hands. Klaproth presented also his results in Gehlen's *Journal* where his article appeared in an issue just before that containing the report of Hisinger and Berzelius. This led to a dispute over the priority of the discovery.

Unfortunately, it has not been established at which exact time Gehlen received each paper for publication in his chemical journal, but in his letter to Hisinger in May 1804 Gehlen gives Berzelius and Hisinger the honor of having discovered a new metal and as a consequence, the name suggested by Berzelius and Hisinger has prevailed. However, it is nowadays generally accepted that the discovery of cerium took place simultaneously and independently both in Sweden and Germany and consequently Hisinger, Berzelius and Klaproth are usually named as co-discoverers of cerium.

The Discovery of Thorium

The discovery of thorium is more straightforward story. In 1829, Berzelius received a mineral sample from the island of Lövö, Norway, sent to him by pastor H.M.T. Esmarck. The mineral resembled gadolinite in appearance being black and heavy but turned out to be a silicate of a new metal which Berzelius named thorium. The mineral ThSiO_4 was given the name thorite.

Berzelius must have been pleased with this discovery because in 1815 he had made a mistake by prematurely announcing the discovery of a new metal oxide which he had named thoria after the ancient Scandinavian god, Thor. This substance turned out to be yttrium phosphate, however. Now almost 15 years later the search for the new metal had ended and Berzelius kept the name thorium for it.

Concluding remark

The discovery of cerium was a scientific breakthrough for the young Berzelius while during the time of his thorium investigations he was a respected chemical authority and probably the best mineral analyst in Europe. Cerium and thorium are the only f-elements discovered by Berzelius, but he also played a significant role in the investigations of Mosander as will be seen in the last part of this series where also a comprehensive list of literature will appear.

Lauri Niinistö
Professor of chemistry

CONFERENCES

RERC-22

The 22nd Rare Earth Research

Conference has been held at Argonne National Laboratory (Illinois), from July 10-15. Despite an unfortunate political problem (see below), the conference chaired by Lynne Soderholm (ANL) with Suzan Kauzlarich (Davis University) as program chair was a real scientific success. Participation was around 200 and again the magic of mixing chemists, physicists, spectroscopists and industrial people worked. Plenary sessions were well attended and provided a wealth of information on widely different fields : new magnetic materials which may revolutionize refrigeration industry (K. Gschneidner Jr.), present developments in coordination chemistry, especially in the field of biomedical analyses (J.-C. Bünzli), upconversion processes in lanthanide doped halide lattices (H. Güdel) and highlights on new X-ray scattering studies (D. Gibbs). The 9th F.H. Spedding award was granted to M. Brian Maple who gave a lecture on novel electronic states and superconducting and magnetic phenomena in f-electron materials.



Two happy, but somewhat tired organizers : Lynn Soderholm (left) and Suzan Kauzlarich (right).

Sixty invited lectures and about 200 posters were presented during 16 sessions (main themes : environmental, coordination, solid state and medicinal chemistry;

physics, applied spectroscopy, solid state electrolytes, non linear optics, X-ray and neutron scattering; rare earth materials for future automobiles). Discussions and exchanges were quite animated. And so was the conference banquet, followed by a welcome jazz and dance party. Moreover, the organizers had arranged for a perfect weather and for a visit of the Advanced Photon Source (Synchrotron Laboratory) of ANL opened in 1996. The latter facility was presented in detail by Stephen Wasserman during the opening ceremony on Sunday.

The only sad aspect was that due to late publication of the new regulations imposed by the US government and regarding the access of National laboratories to certain nationals, Chinese scientists were prevented to attend the meeting. As stressed in the opening ceremony by ANL officials, this is clearly unacceptable, especially that ANL is not a weapons laboratory.

The next American conference will be held in 2002 at the University of California, Davis and we encourage all the rare-earthers to register. More information will be disclosed in this newsletter as soon as it is available.

We thank Lynne Soderholm, Suzan Kauzlarich, Kay Foreman (the Conference secretary) and all their collaborators, as well as the technical staff of ANL, for their competence and nice hospitality.

Red.

Statement on Scientific Openness

The Executive Committee of the European Rare Earth Research Conference is deeply concerned

about the consequences of the restrictions imposed by the American Department of Energy to foreign visitors at national laboratories. The Executive Committee is in complete agreement with and support the statement on scientific openness made on May 21, 1999 by the council of the American National Academy of Sciences.

The Executive Committee of ERES thinks that the IUPAC rules on the attendance of scientific meeting should be applied anywhere in the world, that is no scientist should be denied participation in a scientific conference or workshop based on his nationality, sex, race, religion, or political opinions.

Rare Earths 2001 Brazil

Brazil is South America's largest country with an area of 8'512'000 km² and its population is around 155 million. The country is well known for its beauty and for hosting excellent universities and a hefty research on rare earths, stirred by the occurrence of rare earth minerals on part of the coast. Professor Geraldo Vicentini has agreed to organize an international conference on f-elements for the first time in Brazil.

The conference will be held at the University of São Paulo and will feature the following topics:

- Environmental sciences
- Toxicology
- Biomedical applications
- Analytical, solution chemistry
- Coordination chemistry
- Organometallic chemistry
- Materials sciences

- Spectroscopy, luminescence
- Minerals, extraction and separation
- Catalysis
- Physics, magnetism
- Metallurgy and applications.

The first circular is enclosed and you are encouraged to visit the web sites of the conference (which also allows you to pre-register) :

www.iq.usp.br/geral/RE2001/congress.html

AGENDA

4TH ICFE Sep. 17-21, 2000

Fourth International Conference on f-Elements.

Madrid, Spain.

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Rare Earths 2001 Sept. 2001

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Please send articles on any topic of interest to the f-element community.

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