Rare-earth Information Center INSIGHT

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Andries R. Miedema

In early June Andries R. Miedema, Director of the Philips Research Laboratories, Eindhoven, The Netherlands, died unexpectedly. Andries is probably best known for his method for estimating the heats of formation of binary intermetallic compounds. For a semi-empirical method, the estimated values, when they can be verified experimentally, are quite reliable -- indeed many theorists accept the Miedema values as if they were experimentally determined ones. Needless to say other practitioners, i.e. engineers and applied scientists, have found his method extremely valuable in designing new alloys and materials, conceiving new processes, and making devices and products. He also made other valuable contributions to solid state physics.

Andries was a fine gentleman, an outstanding scientist, and a technological leader. He was also a strong supporter of the Rare-earth Information Center. His death will be a great loss to the scientific, technological and commercial communities. We expect to publish more details in the September issue of **RIC News**.

Problems of the Rare Earth Industry

"Problems of the Rare Earth Industry" was one of the 17 symposia held at the **Rare Earths '92 in Kyoto** international conference (June 1-5, 1992) and consisted of three keynote addresses and one invited paper. The first keynote paper on the "Rare Earth Industry of China" was to have been given by Chuandian Zhou, but was delivered by Ting Du instead when Mr. Zhou was unable to attend the Kyoto meeting. The second keynote paper by P. Falconnet on "The Rare Earth Industry: A World of Rapid Change" was the most provocative (see below). The third keynote address was given by B. T. Kilbourn on "The Balancing Act between Production and Demand, or You Can't Have One without the Other". The final paper was on "The C.I.S. [Commonwealth of Independent States, formerly the U.S.S.R.] Rare Earth Industry of Today" and was presented by V. D. Kosynkin.

Pierre Falconnet of Rhône-Poulenc, Paris, noted that the People's Republic of China (P.R.C.) plays an important and critical role in the worldwide rare earth industry because they control about 51% of the rare earth reserves, but more importantly they have a monopoly on ionic-type rare earth deposits which are rich in the heavy lanthanides and yttrium. Furthermore, the rare earths are easily and inexpensively extracted from these ionic-type clays which are found in the southern provinces of P.R.C. In the late 1980's, a price war was started among the Chinese (P.R.C.) domestic producers, which led to a dramatic decrease in the prices of most rare earth products on the international market. This had, and still has, a detrimental effect on the

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entire rare earth industry, both inside and outside P.R.C. Falconnet showed that because of this price war, the export revenues in the P.R.C. declined by 40% from 1989 to 1990, even though the volume of separated products increased by a factor of 2.1, which should have more than compensated for the drop in the exported volume of the raw materials (ores and concentrates). There has been an attempt by the central government to control the production and export of rare earth materials, but there is little evidence forthcoming that authorities have been successful to date.

Falconnet also predicted what will happen to the worldwide industry by the year 2000. He forecasts an overall growth rate of between 4 and 6% per year [which is about half of that predicted by Roskill Information Services, Ltd., London], and that Asia will be the biggest rare earth consumer. The consumption of unseparated rare earths in catalysis, metallurgy and glass/ceramics is predicted to grow at a rate of about 2% per year, while the separated rare earths will show significant growth (i.e. double the tonnage from 1990 by the year 2000). The biggest growth is expected to be for those rare earths used in "magnetism" -- a 16% per year growth. Phosphors are expected to grow at about 6% per annum.

V. D. Kosynkin of the All-Russian Research Institute of Chemical Technology, Moscow, reviewed the state of the rare earth industry in the Commonwealth of Independent States (C.I.S.). The major fraction of rare earth materials comes from the mining of loparite deposits. Loparite is a rare earth (mostly lights) niobate titanate, and is processed for its tantalum, niobium and titanium contents as well as the rare earths. The small thorium content (0.67%) in loparite also presents some environmental and processing problems. Kosynkin predicts that this ore will continue to account for the major share of the rare earths produced in the C.I.S. in the foreseeable future, although he expects that apatite (a calcium fluorophosphate) may be processed for their rare earth content in the future. Currently yttrium-enriched deposits of synchisite (a fluorocarbonate) and uranium-ferrophosphate are an important source for yttrium and the heavy lanthanides, however, both are expected to become less important in the future since their reserves are limited. The other important ore which is mined for rare earths is monazite. Currently about 8500 mt of rare earth oxides are produced annually in the C.I.S., of which 6500 mt are obtained from loparite. Kosynkin predicted that the production of the rare earth materials in the C.I.S. will account for at least 20% of the world's market, however, no time table was given for this achievement to occur.

The papers by Zhou (presented by Du), both from the Chinese Society of Rare Earths, Beijing, and Kilbourn, Unocal/Molycorp, White Plains, New York, did not produce any big surprises or any new major developments. Zhou's paper mainly presented statistical information about the various rare earth products and the amounts used in various categories in 1990 in the People's Republic of China. Some export values were also cited. Kilbourn noted that there is a current trend for cerium to be in greater demand than lanthanum beyond the natural cerium to lanthanum ratio in bastnasite, and thus the cost of producing cerium materials is higher than if there were a balance between the two. Furthermore, the lanthanum-rich concentrates need to be stored. He noted that the health of the lanthanide producers will depend to some extent on stimulating an increased demand for lanthanum-rich products. He also suggested some applications which could bring the cerium to lanthanum ratio into balance.

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