



# The Rare Earth Elements: An Introduction (SpringerBriefs in Earth Sciences)

By J.H.L. Voncken

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## The Rare Earth Elements: An Introduction (SpringerBriefs in Earth Sciences) By J.H.L. Voncken

This book deals with the rare earth elements (REE), which are a series of 17 transition metals: scandium, yttrium and the lanthanide series of elements (lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium and lutetium).

They are relatively unknown to the wider public, despite their numerous applications and their critical role in many high-tech applications, such as high-temperature superconductors, phosphors (for energy-saving lamps, flat-screen monitors and flat-screen televisions), rechargeable batteries (household and automotive), very strong permanent magnets (used for instance in wind turbines and hard-disk drives), or even in a medical MRI application.

This book describes the history of their discovery, the major REE ore minerals and the major ore deposits that are presently being exploited (or are planned to be exploited in the very near future), the physical and chemical properties of REEs, the mineral processing of REE concentrates and their extractive metallurgy, the applications of these elements, their economic aspects and the influential economical role of China, and finally the recycling of the REE, which is an emerging field.

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## Editorial Review

### Review

“This exceptionally well-written, compact, balanced, and highly informative work is primarily designed for the well-educated scientist/engineer and moderately technical economist. ... Numerous end-of-chapter references, charts, tables, and graphs support the text. ... it is an essential volume for the advanced student and general professional interested in the science, engineering, and economics of rare earth metals. Summing Up: Highly recommended. Upper-division undergraduates through professionals/practitioners.” (T. L. T. Grose, Choice, Vol. 53 (11), July, 2016)

### About the Author

Jack Voncken (1959) studied Geology at Utrecht University, the Netherlands. In 1984 he passed his “Doctoraal Examen” (equivalent to an MSc) in Geology with a major in (Igneous) Petrology and minors in Exploration Geochemistry and Economic Geology. After graduating he conducted PhD research, also at Utrecht University, on the synthesis, characterization and crystallography of two rare ammonium-aluminum-silicates (buddingtonite,  $\text{NH}_4\text{AlSi}_3\text{O}_8$ , and tobelite,  $\text{NH}_4\text{Al}_2\text{Si}_3\text{AlO}_{10}(\text{OH})_2$ ) and their Rb-and Cs-analogues.

He obtained his PhD in 1990 at Utrecht University with a thesis entitled “Silicates with Incorporation of  $\text{NH}_4^+$ ,  $\text{Rb}^+$  or  $\text{Cs}^+$ ”. Between 1988 and 1990, he was employed at Twente University of Technology, Enschede, the Netherlands, where at the Inorganic Materials Science section of the Faculty of Chemical Technology he developed a method for measuring drying stresses in thin drying gel coatings.

In 1990 he joined Delft University of Technology. He started at the Faculty of Mining and Petroleum Engineering, in the Raw Materials Technology (later called Resource Engineering) section, as an assistant professor for Mineralogical Aspects of Raw Materials. From 2006 until 2011, after the discontinuation of the Resource Engineering section, he worked in the Applied Geology section. After the re-establishment of the Resource Engineering section in 2011, he returned to that group, again as an assistant professor. The Faculty of Mining and Petroleum Engineering merged with the Faculty of Civil Engineering in 2007 to form the Faculty of Civil Engineering and Geosciences.

Jack Voncken’s specialties lie in Economic Geology, in Ore Minerals and Industrial Minerals, and in analytical techniques and characterization techniques for minerals and rocks. Given his interest in Ores and Industrial Minerals, he has also focused on Rare Earth Elements since 2009.

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