Advances in Rare Earths: From Mine to Materials

Rare earth elements (REE) are quickly becoming an ever-present part of our society, due to their unique chemical and physical properties. Their various uses in high strength permanent magnets, phosphors, lasers, catalysts, catalytic converters, and electronic devices make REEs key enablers of a wide range of hi-tech applications and everyday processes and products as well. Accelerating development of new advanced technologies generates an ever-increasing demand for REEs, with emphasis on identifying new resources and efficient international supply chains to ensure adequate supply for present and future use. REEs are not traditional commodities but rather specialty chemical products, which need to be developed for specific end uses. Metallurgy, therefore, is critical to the business of rare earths, the main challenges constituting the extraction, separation and the recovery of the individual rare earth elements.

The Canadian Metallurgical Quarterly (CMQ) is well known for publishing original contributions on all aspects of metallurgy and materials science, including mineral processing, hydrometallurgy, pyrometallurgy, materials processing and physical metallurgy. In addition to this, the CMQ often publishes special issues focusing on important materials science and engineering challenges. With due consideration of the last few years only, the following Special Issues have been published: Mineral Processing – in Honour of Dr. J.S. Laskowski (2007), Copper Hydrometallurgy – in Honour of Dr. John E. Dutrizac (2008), Advances in Processing, Microstructure and Performance of High Strength Steels (2009), Mineral Processing Science and Technology – in Honour of Dr. James Finch (2010), Aerospace Materials Development, Manufacturing and Application (2011) and Advances in High Temperature Joining of Materials (2012).

Last year, the 51st Conference of Metallurgists (COM 2012) featured its inaugural Rare Earths Symposium. The organisation of this very successful symposium has been truly a collaborative effort, with organising committee members representing academia, industry and government research. This symposium featured 44 presentations, the largest at the conference, with presenters coming from Canada, United States, Netherlands, Austria, Poland, Korea, Germany, China, Brazil, and Japan. In addition to the diverse international attention that this symposium has received, the papers presented, when viewed as a collective, represent the full rare earths supply chain: geology→extractive metallurgy and environmental issues→separation and refining→physical metallurgy→recycling rare earths from scrap. The significant number of research papers submitted for this conference, and the wide topics addressed, bring into perspective the international dimension of the rare earths industry as a truly joint effort.

Since its creation, the CMQ has been an important venue to disseminate world-class and world-encompassing scientific information. The combination of the ever-increasing interest in the field of rare earths science and technology and the track record of the CMQ on promoting leading edge research topics have culminated in the preparation of this special issue entitled “Advances in Rare Earths: From Mine to Materials”. This special edition represents a collection of works from the main Canadian groups involved in research and technology development in the field of rare earths. The scope of this present special issue embraces all of these aspects with a fundamental angle. It is our hope that the advised readers will find many of the research findings presented in this publication informative and useful.

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