

## Book review

# Element recovery and sustainability

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**Andrew J. Hunt** (Ed.)

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*Element recovery and sustainability* edited by Andrew J. Hunt provides an insight into elemental sustainability and methods for element recovery. Three main topics are discussed: (1) importance of elemental sustainability; (2) methods for metal recovery; and (3) processes for elemental recovery from “waste” and end-of-life (EOL) products.

The importance of elemental sustainability (use and recovery), as well as the growing concern about long-term supply of critical elements, are presented in chapter 1. In particular, the authors discuss the losses of platinum group elements (PGEs) from the anthroposphere to the biosphere in chapter 7. He concludes that the recycling rate can be dramatically improved only by increasing collection of EOL products.

The methods for metal recovery are explained in chapters 2 and 3. In the second chapter, the authors present a brief but comprehensive summary of traditional metal production processes. Then the authors present major by-products that can be obtained from metallurgical waste. In the third chapter, the authors describe ionometallurgy, which is a novel method for metal recovery using ionic liquids. However, the authors explain that chemistry of ionic liquids is not well understood, thus more research should be done in this area.

The processes for elemental recovery from “waste” and EOL products are presented in chapters 4, 5, 6, 8 and 9.

In chapters 4 and 5 the authors describe the use of both living and non-living biomass to recover elements from waste. Plausible mechanisms for the biosorption

process are explained. Additionally, an overview of hyper-accumulation of metals by plants is given. The authors explain that plants can be used to clean-up contaminated soils, while at the same time recover metals for further use.

In the chapter 6, the authors describe the uses of f-block elements (lanthanides and actinides) and their recovery (only in the case of lanthanides). Then the authors present specific strategies for recovering metals from different products such as batteries.

In chapter 8, the authors explain that electrical and electronic equipment (EEE) are resource intensive and resource wasteful, e.g., liquid crystal displays (LCDs). Then the authors explain that recycling of waste electronic and electrical equipment (WEEE) to recover elements is more beneficial than primary ore mining, due to the higher concentration and purity of certain metals in WEEE than in primary ores. Finally, in chapter 9, the authors address the mining of municipal solid waste (MSW) and EOL as a source of element recovery. The authors state the critical importance that society recognized the value of the elements present in the “waste”.

In conclusion, the book presents an objective insight into element recovery and sustainability. It can be used in both undergraduate and post-graduate programs, since the information is presented in a simple and coherent manner. Several case studies are included which allows a better understanding of the different topics. Besides, the book contains several references for those who want to deepen into any of the topics presented.

**Carlos Ortega**

Department of Chemical Engineering and Chemistry

Eindhoven University of Technology

Den Dolech 2

5612AZ Eindhoven

The Netherlands

E-mail: c.e.ortega@tue.nl