Protecting Endangered Elements

EuCheMS Brussels offices
Rue du Trône 62, 7th floor, Brussels
22nd September, 2015
Chaired by Ian Duncan, MEP

Registration is available at http://bit.ly/1JBB1cR

9:30 Coffee and Registration
10:00 **Setting the Scene** - *Ian Duncan, MEP*
10:15 **Hunting the Elements of the Periodic Table on Spaceship Earth** - *Nicola Armaroli, Italian National Research Council*
10:35 **Sustainable Manufacturing of Transparent Conducting Oxide (TCO) Thin Films** - *Claire Carmalt, University College of London*
10:50 **The Story of Phosphorus** - *Willem Schipper, Willem Schipper Consulting*
11:05 **Critical Raw Materials: Possible EU Policy Intervention Strategies Based on Life Cycle Approach** - *Constantin Ciupagea, European Commission Joint Research Centre*
11:20 **Zero-Waste Valorisation of Critical Metal Containing Secondary Resources** - *Peter Tom Jones, KU Leuven*
11:35 **Panel Discussion**
12:10 **Conclusions and Closing Remarks** - *David Cole-Hamilton, EuCheMS President*
12:30 Light Buffet Lunch

During this workshop, speakers will explore the importance of raw materials in our everyday life and will discuss what can chemistry do to prevent the scarcity of these elements. This event will also look at the current state of the Circular Economy Package.

For more information please contact secretariat(at)euchems.eu

Chair

Ian Duncan, Member of the European Parliament (MEP).
Ian Duncan is a member of the Committee on the Environment, Public Health and Food Safety, and the Vice-Chair of the European Parliament Delegation for relations with the countries of South Asia.

Hunting the Elements of the Periodic Table on Spaceship Earth

Nicola Armaroli, Italian National Research Council

Remarkable developments in electronics and digital technologies have prompted a substantial dematerialization of modern society. However, this trend is counterbalanced by a marked increase of personal device ownership – at a scale never experienced in previous technological phases – and a dramatically expanded use of chemical elements; some of them were once irrelevant but now are essential to devices/machines for delivering increasingly sophisticated services. Such a "element hunting" within the periodic table is further fostered by an increase of the global demand for food, energy, materials and services, driven by economic expansion and population growth. This worrisome development, which has accelerated in the last 30 years, is unfolding in a tiny planet Earth, a sort of spaceship with a finite number of natural resources in its hold (e.g., minerals and biomass). A short overview of the above unfolding scenario will be given, through selected examples of endangered elements and dematerialization vs. material intensification trends. Key concepts related to materials requirements for the transition to renewable energy sources will be illustrated, highlighting the problematic situation of Europe, which is a highly intensive utilizer of the periodic table, but is by far the poorest continent in terms resource availability. Some recommendations will be suggested for the protection of the endangered elements of the periodic table through recycling, for the welfare of future generations. This is a challenging feat, which can be accomplished only through chemistry research and development.

Sustainable Manufacturing of Transparent Conducting Oxide (TCO) Thin Films

Claire Carmalt, University College of London

Current research involves developing processes and resources towards sustainable and inexpensive high quality transparent conducting oxide (TCO) films on float glass. In particular replacement materials for Indium Tin Oxide (ITO) and F-doped Tin Oxide (FTO) are being developed. These materials are used in low-e window coatings (>£5B pa), computers, phones and photovoltaic devices. The current electronics market alone is worth in excess of £0.9 Trillion and every tablet PC uses ca 3g of tin. Indium is listed as a critical element- available in limited amounts often in unstable geopolitical areas. Tin metal has had the biggest rise in price of any metal consecutively in the last four years (valued at >£30K per ton) and indium is seen as one of the most difficult to source elements. We have been developing sustainable upscaled routes to TCO materials from precursors containing earth abundant elements (titanium, aluminium, zinc) with equivalent or better figures of merit to existing TCOs. Our method uses Aerosol assisted chemical vapour deposition to develop large scale coatings.

The Story of Phosphorus

Willem Schipper, Willem Schipper Consulting

The presentation will focus on the unique role and importance of the element phosphorus in our society. Following the element through its various stages of use and disposal, an overview will be given of recovery options and how these can be implemented. Technology development as well as policies play a pivotal role in keeping phosphorus in cycles.

Critical Raw Materials: Possible EU Policy Intervention Strategies Based on Life Cycle Approach

Constantin Ciupagea, European Commission Joint Research Centre

Critical Raw Materials (CRMs) combine a high economic importance to the EU with a high risk associated with their supply. To address current and future challenges, the European Commission has created in 2011 a list of Critical Raw Materials (CRMs), and this list was updated in 2014. Examples of CRMs include rare earth elements, cobalt, indium and platinum group metals, but also phosphorus and several biotic raw materials have been added to the extended list. The methodology to be used for the next revision of the list is under review. The challenges associated to the CRMs go beyond the sustainable supply of raw materials for the EU economy and they touch the following components of the upcoming Circular Economy strategy of the EU: waste management (e.g. of Waste Electric and Electronic Equipment), supply of secondary materials, product eco-design.
The presentation will introduce a couple of initiatives under development at the Joint Research Centre of the European Commission that try to address these challenges in an integrated way and with a life cycle perspective. For example, new parameters to be potentially considered when assessing the criticality of materials will be introduced; it concerns in particular the possibilities to substitute CRMs in end applications and to better consider the supply of secondary materials in the supply risk analysis. It will also introduce new ways to improve the recyclability of those materials, by interventions on the products and considering performances of recycling technologies. The policy implications of these initiatives will also be discussed.

Zero-Waste Valorisation of Critical Metal Containing Secondary Resources

Peter Tom Jones, KU Leuven

Europe does not possess vast, easily accessible deposits containing critical metals. However, it does have substantial amounts of End-of-Life products and secondary industrial residues (tailings, sludges, slags and dusts), which often contain significant concentrations of critical metals. To provide the EU with a reliable source of domestic critical metals, the potential of both these End-of-Life products and low-grade resources needs to be unlocked through urban and landfill mining. For the secondary residues traditional pyro- and hydrometallurgy does not suffice. Therefore, new “metallurgical unit operations” (incl. plasma-,

bio-, solvo, electro- and ionometallurgy) are required, which can be integrated in environmentally-friendly, zero-waste valorisation flow sheets for specific residues, ranging from critical metal extraction, critical metal recovery to (residual) matrix valorisation. In his lecture Dr. Peter Tom Jones provides a general overview of this zero-waste philosophy and illustrates this with case-studies performed at KU Leuven for both End-of-Life products and freshly produced and landfilled industrial residues.

Conclusion and Closing Remarks
David Cole-Hamilton, EuCheMS President

EuCheMS, the European Association for Chemical and Molecular Sciences, aims to nurture a platform for scientific discussion and to provide a single, unbiased European voice on key policy issues in chemistry and related fields.
Representing more than 160,000 chemists from more than 40 Member Societies and other chemistry related organisations, EuCheMS relies on a unique network of active researchers involved in all the fields of chemistry. Through this network, EuCheMS organises several specialised academic conferences as well as the biannual EuCheMS Chemistry Congress, the European congress of chemical sciences. EuCheMS also promotes the role and image of the chemical sciences among the general public and policy-makers through social media, newsletters and through the organisation of conferences and workshops open to the society. Through the promotion of chemistry and by providing expert and scientific advice, EuCheMS aims to take part of the solution to today´s major societal challenges.