RECENT ACHIEVEMENTS AND ACTIVITIES OF RESEARCH GROUP "INSTRUMENTAL METHODS OF ANALYSIS-ENVIRONMENT"
SCHOOL OF CHEMICAL ENGINEERING, NATIONAL TECHNICAL UNIVERSITY OF ATHENS

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UTILIZATION OF INDUSTRIAL BY-PRODUCS FOR THE RECOVERY OF VALUABLE ELEMENTS

Red mud is the high alkaline residue of bauxite treatment for alumina production by Bayer method. In Greece, 750.000 tons of red mud are produced annually from **ALUMINIUM OF GREECE (AoG)**. The by-product is rich in main elements and contains many valuable trace elements such as scandium, yttrium and lanthanides known as rare earth elements. Full exploitation of Greek red mud can result to almost 1000 tons of rare earths oxides per year.
The research team is a pioneer in rare earths recovery from red mud and has over 20 years of experience in this field. An innovative method for the bauxite residue utilization on lab and partially on pilot plant scale has been developed. The method includes mineral acid leaching, ion-exchange and solvent extraction/backstripping processes and high performance liquid chromatography for the individual separation of the elements in high purity. Our future research is focused on further optimization of the method aiming at its industrial application.

PARTICIPATION IN THE EUROPEAN PROGRAM HORIZON 2020

Project SCALE: PRODUCTION OF SCANDIUM COMPOUNDS AND SCANDIUM ALUMINUM ALLOYS FROM EUROPEAN METALLURGICAL BY-PRODUCTS. **European Community**
http://cordis.europa.eu/project/rcn/206331_en.html

Collaborators:
K. Hatzilyberis, Department of Process Analysis and Plant Design
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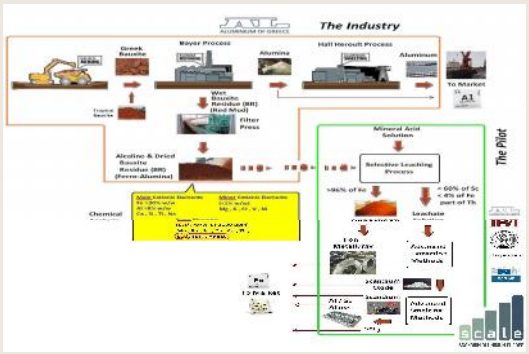
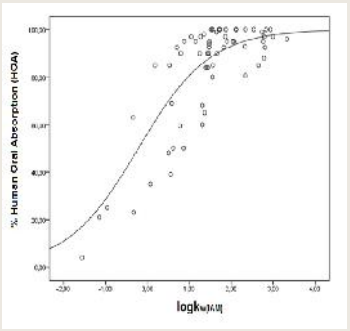


Red mud (bauxite residue) can be also used as adsorbent for the removal of hazardous anions such as BrO_3^- from cooling water. It is treated with HCl under boiling to obtain adsorptive capability, which is enhanced by the binding of the cationic surfactant Cetyl Tri-Methyl Ammonium Chloride (CTAC).

IMMOBILIZED ARTIFICIAL MEMBRANE (IAM) CHROMATOGRAPHY-APPLICATIONS TO DRUGS DESIGN AND ENVIRONMENTAL TOXICOLOGY

Immobilized Artificial Membrane (IAM) Chromatography is a type of biomimetic liquid chromatography used to investigate interactions between biological membranes and xenobiotics (drugs, environmental contaminants and generally bioactive compounds). IAM chromatographic columns consist of phospholipids immobilized to a silica skeleton. Since IAM chromatography mimics the lipid environment of cell membranes, it has the potential to mimic phenomena which are directly related to the permeability of compounds through cell membranes or retention to phospholipids. Prediction of % Human Oral Absorption (% HOA), toxicity (e.g. hepatotoxicity, phospholipidosis) and ecotoxicity (e.g. median toxicity expressed as LD_{50} or LC_{50} for aquatic organisms, bio-concentration factor (BCF)) are included in its applications.



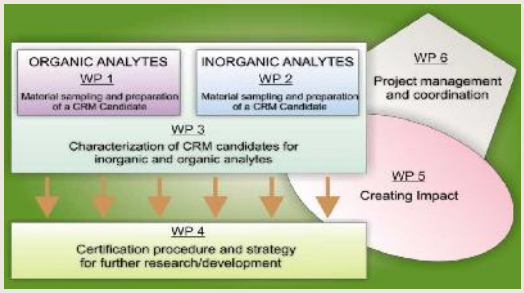
PREDICTIVE MODEL OF HUMAN ORAL ABSORPTION OF DRUGS

REFERENCE MATERIALS PRODUCTION FOR ENVIRONMENTAL ANALYSIS

PARTICIPATION IN THE EUROPEAN EMPIR PROGRAM

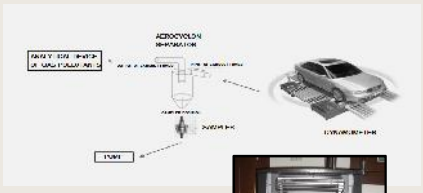
Project: ENVCRM

MATRIX REFERENCE MATERIALS FOR ENVIRONMENTAL ANALYSIS



AIR POLLUTION - PARTICULATE MATTER

➢Qualitative and quantitative analysis (heavy metals, organic species, ions) of filters from aerosol samples (PM10/PM2.5). Identification of pollution sources.
➢Platinum Group Element Emissions from Automobile Catalysts: Development of a novel sampling system at the exhaust pipe of vehicles. Determination of platinum group elements by voltammetric techniques using ion-exchange separation/pre-concentration and GFAAS/ICP-MS *(M. Paraskevas, PhD thesis)*.
➢Particulate matter emissions from combustion of different types of wood pellets *(A. Zossima, PhD thesis, Post-doc)*.



Pellet combustion

PM10/PM2.5 sampler

PARTICIPATION IN THE EUROPEAN PROGRAM EMPIR
Project: AEROMET
AEROSOL METROLOGY FOR ATMOSPHERIC SCIENCE AND QUALITY

EMPIR CALL 2016 – Energy, Environment, Normative and Research Potential

ORGANIZATION OF INTERNATIONAL SCIENTIFIC CONFERENCES

Organization of the international conferences of Analytical Chemistry «IMA» (Instrumental Methods of Analysis - Modern Trends and Applications) every two years with the participation of experts all over the world.

IMA-2017
17-21 September 2017
Heraklion-Crete, Greece

RESEARCH GROUP "INSTRUMENTAL METHODS OF ANALYSIS-ENVIRONMENT"
http://www.chemeng.ntua.gr/the_instrumental_methods_of_analysis_environment_unit