RECOVERING / REMOVING OF HEAVY METALS FROM WASTE WATER BY ELECTROCHEMICAL TECHNOLOGY

CONTACT DETAILS:

Research Results Transfer Office-OTRI
University of Alicante
Tel.: +34 96 590 99 59
Email: areaempresas@ua.es
http://innoua.ua.es

ABSTRACT

The Applied Electrochemical and Electrocatalysis Group (LEQA) at the University of Alicante has a high experience, expertise and know-how to develop and carry out the effective recovering and removing of heavy metal in waste water by electrochemical technology. The Group also has a pilot plant fully equipped with the necessary infrastructure in order to development the pre-industrial phase and scaling-up of the processes.

TECHNICAL DESCRIPTION

Applied Electrochemistry is the employment of electrochemical processes in any type of industrial application as synthesis of pharmaceutical products, nanotecnologies, waste treatment, heavy metals recovering, metallic depositions, etc. The Applied Electrochemical and Electrocatalysis Group (LEQA) at the University of Alicante is focused since several years on the investigation of new electrochemical processes and transfer of the knowledge and the technology to the industry. One of the industrial applications of the electrochemical technology is the electrodeposition treatment of waste water in order to remove and/or to recover heavy metals.

The activity of the group in the research line of metal electrodeposition is mainly focused in two objectives:

1. Development of electrochemical processes for the recycling and recovery of metals (Pb, Zn, Ni…) from their secondaries. The use of electrochemical processes allows to obtain metals of a bigger purity and it supposes a much less polluting alternative that the classic pyrometallurgy, since avoids the emission of gases, sulfur and metal particles.

2. Removal of heavy metals in waste waters. The existence of heavy metals in waste waters constituted one of the most important problems of contamination at present, owed to their high toxicity and cumulative properties. Respect to their origin, they are generated almost exclusively as industrial effluents. For example, in metallurgical processes, metallic coatings, dyes, batteries...

According with the research lines and the experience, the Group is able to develop highly effective treatment to:

· Metal finishing processes (electroplating,…).

· Recovery of precious metals (silver from photographic material,…).

· Recovery of non precious metals (lead coming from batteries,…).

· Elimination of impurities in chemical reagents.

· Electroremediation of grounds.

The recovery of the metal is carried out by means of its deposition in metallic form on the cathode in an electrochemical reactor. It supposes the formation of a new solid phase. The type of electrochemical reactor to use is determined by the value of the recovered metal and by environmental laws. In second place, this election of the design is determined by the possibility of recycle the metal in metallic form or as a concentrated solution.

The recovery of metals by electrodeposition is usually carried out from concentrated solutions, using an open reactor. This

geometry facilitates the extraction of the recovered massive metal. When the main objective is to remove a pollutant metal from an effluent, it is common to find concentrations of heavy metals inside the range 1-1000ppm. These low concentrations force to impose low current densities if conventional reactors are used. Owed to the low concentration of the metal in solution, its important the development of electrochemical reactors able to remove the metals in these experimental conditions. There are two main strategies for this point:

1. Use of three-dimensional electrodes. This type of electrodes (porous electrodes, piling up of spherical material,...) possess very high superficial areas. This allows to reach high working current densities and, therefore, to increase the conversion for step.

2. Increase the mass transport conditions by means of generating turbulence.

Design and pilot plant capability

The Applied Electrochemical and Electrocatalysis Group (LEQA) also has a pilot plant fully equipped with the necessary infrastructure in order to development the pre-industrial phase and scaling-up of the processes. The pilot plant has developed several electrochemical reactors to produce chemicals at pre-industrial and industrial level.

ADVANTAGES AND INNOVATIVE ASPECTS

· The use of electrochemical processes allows to obtain metals of a bigger purity and in consequence much less polluting than the traditional treatments.

· It is a environmentally friendly technology since it avoids the emission of gases, sulphur and metal particles.

· This electrochemical treatment effectively solves one of the most important problems of environment pollution at present.

· It is a cost and safety effective technology.

CURRENT STATE OF DEVELOPMENT

The electrochemical technology has been already tested at laboratory and preindustrial level and the research team has several years of experience in this field. The installations of the pilot plant are already being working and some projects for Spanish and European clients has been carried out successfully. All the technicians and management staff have the experience necessary to guarantee the success of the projects.

MARKET APPLICATIONS

This treatment methods could be of interest to:

· Industries with waste waters with high concentration of heavy metals as described above. Potential clients could be textile industry, metal - processing industry, chemical industry, etc.

· Consultancy companies from the environmental sector with activities in the effluents treatment which would like to add new effective methods to their capability.

COLLABORATION SOUGHT

The Applied Electrochemical and Electrocatalysis Group (LEQA) at the University of Alicante has a high experience and know-how as well as the installations required to develop new the industrial treatments of high polluted effluents. The Group could:

· develop electrochemical processes for the recovering and removing of heavy metals in waste water at laboratory, pre-industrial and industrial level.

· design and build of pilot industrial electrochemical plants included their automation according with the specifications of the client

In this sense, this research centre seeks to transfer the technology and know-how on electrochemical field to companies by mean of patent licence or know-how agreements.

INTELLECTUAL PROPERTY RIGHTS

Concerning the use of the equipment, development and scaling of processes, process feasibility, etc, all information is protected by know-how.

RESEARCH GROUP PROFILE

In the following link you will find a description of the nature and activities of the Research Group:
https://cvnet.cpd.ua.es/curriculum-breve/grp/en/electroquimica-aplicada-y-electrocatalisis/356

MARKET APPLICATION (4)

Footwear and Textile
Pollution and Environmental Impact
Water Resources
Chemical Technology