

ELECTROCHEMICAL REACTOR FOR ECONOMICAL AND EFFICIENT REGENERATION OF SPENT ACTIVATED CARBON

DESCRIPTION OF THE TECHNOLOGY

An electrochemical reactor has been developed to regenerate spent activated carbon from different industries. It is characterized because it has an efficiency between 90-100%. It is a fast, selective and very economical method, and it allows to be carried out in the same facilities where the spent activated carbon is located. In addition, it is an environmentally friendly technology.

This novel reactor has two possible configurations: concentric cylindrical electrodes and parallel flat electrodes. It is a very versatile reactor, and it allows optimal regeneration of industrial quantities (multikilo) of activated carbon saturated with pollutants from different industries.

The electrochemical reactor comprises two compartments (separated by an ion exchange membrane), each with one electrode, connected to two independent electrolyte recirculation circuits; an upper inlet for the activated carbon to be regenerated (from a tank or hopper), and a lower outlet for the regenerated activated carbon.

Stainless steel, platinized titanium (Pt/Ti), ruthenium oxide (RuO₂/Ti) and iridium oxide (IrO₂/Ti), among others, can be used as electrodes. In general, stainless steel will be used when the electrode is to function as a cathode.

MARKET APPLICATION SECTORS

- Wastewater treatment and water purification.
- Treatment and purification of gases and liquids.
- Metal recovery.
- Food and beverage production.
- Chemical and pharmaceutical sector.
- Catalysis.

TECHNICAL ADVANTAGES AND BUSINESS BENEFITS

Electrochemical regeneration is characterized through the following **advantages**:

- One of the reagents used is electrons (they can be easily supplied by means of a direct current source).
- The process can be stopped immediately.
- It can be carried out in the same facilities where the carbon to be regenerated is located.
- The process has a high selectivity.
- Less carbon dioxide (CO₂) emissions are emitted into the atmosphere.
- It has lower energy consumption (0.031-0.045 kWh/kg) than thermal regeneration (0.52 kWh/kg).

CURRENT STATE OF DEVELOPMENT

Different treatment conditions have been tested (in both configurations and with electrodes of different chemical nature), and the regeneration variables of spent activated carbon from water treatment plants have been optimized.

Two pilot plant scale prototypes (TRL=6) are available for **demonstration** (Figure 2). **Two industrial prototypes** (TRL=7) have also been built to allow the electrochemical regeneration of spent activated carbon in batches of more than 100 kg.

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INTELLECTUAL PROPERTY RIGHTS

The present invention is protected through a **patent application**:

- *Patent title: "Reactor electroquímico para la regeneración electroquímica de carbón activado".*
- *Application number: P202030510.*
- *Application date: 1st June, 2020.*

COLABORATION SOUGHT

Companies interested in acquiring this technology for **commercial exploitation** through **patent licensing agreements** are sought.

Company profile sought: regeneration of spent activated carbon.

RELATED IMAGES

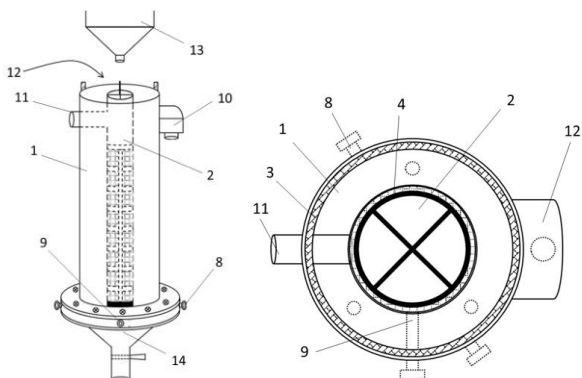


Image 1: schematic view (front and top) of the electrochemical reactor in concentric cylindrical electrode configuration.



Image 2: front view of the pilot plant scale prototype in the parallel flat electrode configuration, with a treatment capacity of 15 kg.

CONTACT

Área de Relaciones con las Empresas
Servicio de Transferencia de Resultados de Investigación-OTRI (University of Alicante)
Phone: +34 965 909 959
Email: areaempresas@ua.es
Web: <http://innoua.ua.es/>