

Electrokinetic procedure and device for extracting ions from a porous structure

Authors: Jorge Feijóo, Teresa Rivas, Xosé Ramón Nóvoa, Lisbeth M. Ottosen, Ondrej Matyscak.

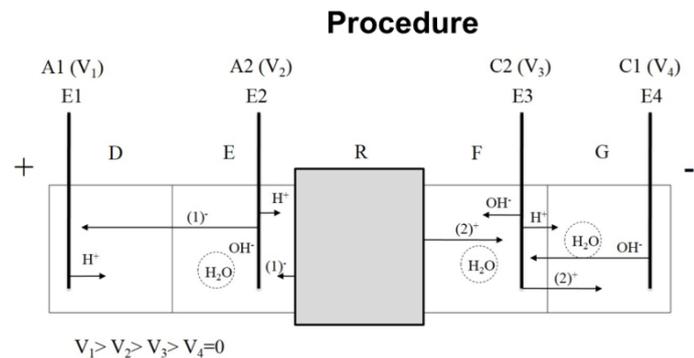
Description

Different techniques have been developed in the field of ions removal from a porous structure, i.e. rehabilitation and intervention of monuments and infrastructure and more specifically in the field of cultural heritage, in order to remove or to reduce as far as possible the soluble salts presented inside of the porous materials used in its construction. Electrokinetic techniques stand out among these techniques for its efficacy. However, these techniques have several limitations or disadvantages which dissuade and limit its application:

- Extreme changes in pH due to hydrolysis of water in the vicinity of the electrodes. These changes can generate chemical alteration processes in the materials presented in the monument.
- Color changes in the treated material due to oxidation, hydrolysis and / or solubilization of some of its minerals, mainly minerals that contain iron in its composition.
- Reduction of the efficacy due to the generation and entering into a porous material of a high quantity of OH^- and H^+ which are the mainly responsible for the transport of the electrical current, reducing the mobilization of the other ions, and therefore decreasing their removal efficiency.
- The drying of the material located on the anode due to an electroosmotic process is a limiting factor in terms of time of application of the technique.

In order to solve these adverse effects, a new procedure of the presented invention allows to establish a distribution of the electric field which can be adjusted through the potential applied to the electrodes which form each of the compartments of the electrolytic cell connected in series. In its preferential configuration: two electrodes in the anodic compartment and two in the cathodic compartment. However, the procedure can be applied with different configurations (in addition to the preferential configuration) depending on the material to be treated and other parameters such as the cost of the process.

Furthermore in the presented invention an electrokinetic device which allows to apply the procedure described above on porous structures such as vertical walls of buildings or infrastructure in all its configurations is registered.



Innovative aspects and advantages

In comparison with current procedures the presented innovation allows:

1. To create an electro-osmotic process at the anode forming particles of water that will increase the duration of the treatment.
2. To give to the system a self-buffering capacity of pH since the system can generate in the anode and cathode groups OH^- and H^+ respectively which can counteract the variations of this parameter;
3. To increase the effectiveness of the current treatments due to this procedure gets to hinder the entrance of the H^+ and OH^- into a porous material.

All of these effects will be greater when the difference of the potential between the electrodes located in the same compartment and between the electrodes located in different compartments will be greater, parameter which is very easily adjustable.

Commercial applications and potential users

The procedure and the device can be used for removal of the ions (soluble salts) presented in the porous materials used in building constructions. Therefore it can be interesting for construction and rehabilitation companies.

Furthermore the applicability of this procedure covers a wide range of sectors, from soil remediation, to the concentration of compound minerals in mining dumps, sewage sludge, etc.

Patent status

The procedure and the device has been protected by Spanish patent P201500913.

Type of collaboration

We look for a company to complete commercial development of portable device under collaboration agreement and the license of the patent.

