Electrokinetic device and procedure for consolidation of porous materials

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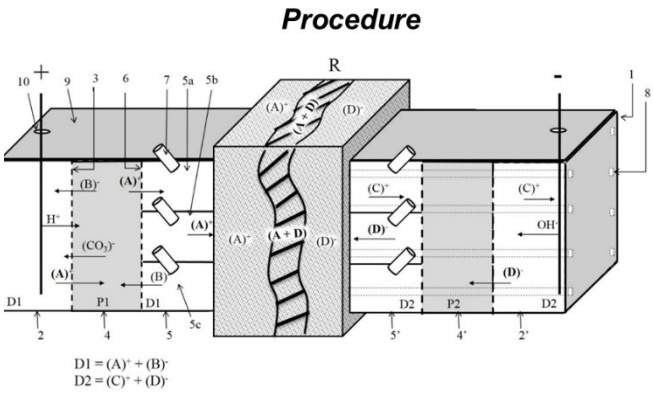
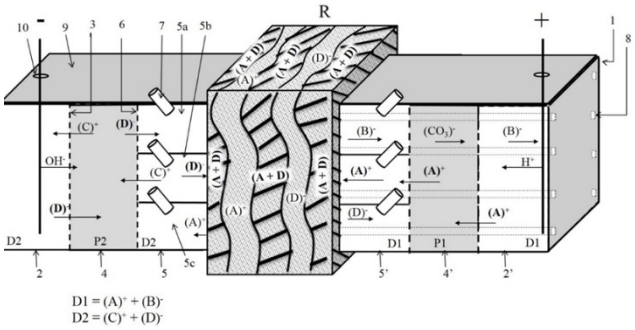
Description

The pores in the porous materials used in construction play an important role in the load-bearing capacity of a material because the higher porosity of a material usually generates a decrease in their mechanical properties. Furthermore, the porosity plays an important role in the durability of the materials, particularly the accessible porosity, because through these pores the alteration agents such as water and soluble salts can enter into a material.



For many years there are several commercial consolidants that try to increase the cohesion between the mineral grains presented in the porous structures that are altered, trying to fill the pores presented within the material and in consequence trying to reduce the accesible porosity. However, these commercial consolidants have several limitations:



- Low penetrability into the porous materials.
- Low durability due to a high rate at which these compounds are degraded.
- Low increase in the geomechanical properties due to their low penetrability.
- Reduction of the moisture transfer of the material only in the superficial layers due to a low penetrability of the consolidant. This reduction increases the harmful effect of alteration agents such as soluble salts which can penetrate into a material through the inner pore. The impossibility of the salts can precipitate on the surface as efflorescence causes that the salts crystallize inside a material as sub-efflorescence and generate pressures against the pore walls of a material.

This invention (that encompasses a procedure and a device that allows to perform its application) allows to solve the limitations of the consolidating treatments used up to now. The procedure consists of two stages, that allows firstly to generate the collapse or to fill the inner pores of a material when the saturation concentration of an inorganic compound previously selected to the treatment application is exceeded in them. In a second stage to collapse and to seal the surface pores.

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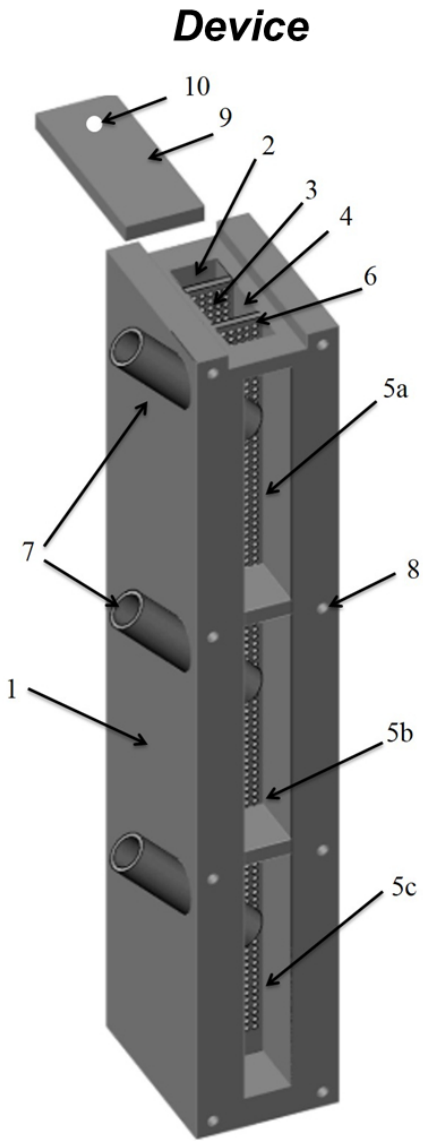
Innovative aspects and advantages

In comparison with current procedures the presented innovation allows:

1. To increase the depth of penetration of the consolidant allowing filling almost all the pores where the current is flowing (superficial and deep pores).
2. To reduce the degradation rate of the consolidant which increases the permanence of the consolidant into a porous material. This is due to that the precipitated product into the pores has a low solubility in water.
3. To reduce the absorption capacity of water by capillarity suction.
4. To increase the geomechanical properties of a material (compressive strength, tensile strength, etc.).

Furthermore the device allows to apply this procedure on vertical surfaces.



Commercial applications and potential users

This procedure and device can be used in:

- Civil engineering and more specifically in the field of materials engineering. It can be interesting for hindering the entering the water and another alteration agents inside the walls and the foundations of a building.
- Conservation of cultural heritage in order to increase the cohesion between the mineral grains presented in those porous structures that are altered.
- Mining sector because it allows to increase the possibility of sale of those ornamental rocks which do not reach the required parameters set by the specific regulations of each country.

Patent status

The procedure and the device have been protected by Spanish patent P201500676.

Type of collaboration

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

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