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# Hydraulic characterization of " Furcraea andina" fibers as alternative medium for bioremediation of contaminated porous media (aquifers) by means of PRB.

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The present level of pollution, increasingly involving groundwaters, constitutes a serious risk for environment and human health. Therefore the remediation of saturated and unsaturated soils, removing pollutant materials through innovative and economic bio-remediation techniques is more frequently required.
Recent studies on natural fiber development have shown the effectiveness of these fibers for removal of some heavy metals, due to the lignin content in the natural fibers which plays an important role in the adsorption of metal cations (Lee et al., 2004; Troisi et al., 2008; C. Fallico, 2010).
In the context of remediation techniques for unsaturated and/or saturated zone, an experimental approach for the hydraulic characterization of the "Furcraea andina" (i.e. Cabuya Blanca) fiber was carried out. This fiber is native to Andean regions and grows easily in wild or cultivated form in the valleys and hillsides of Colombia, Ecuador, and Peru.
Fibers of "Furcraea andina" were characterized by experimental tests to determine their hydraulic conductivity or permeability and porosity in order to use this medium for bioremediation of contaminated aquifer exploiting the physical, chemical and microbial capacity of natural fiber in heavy metal adsorption. To evaluate empirically the hydraulic conductivity, laboratory tests were carried out at constant head specifically on the fibers manually extracted. For these tests we used a flow cell (used as permeameter), containing the "Furcraea andina" fibers to be characterized, suitably connected by a tygon pipe to a Marriott's bottle, which had a plastic tube that allow the adjustment of the hydraulic head for different tests to a constant value.
By this experiment it was also possible to identify relationships that enable the estimation of permeability as a function of density, i.e. of the compaction degree of the fibers. Our study was carried out for three values of hydraulic head (H), namely 10, 18, and 25 cm and for each constant head we repeated the test for three different rate of fiber compaction within the flow cell, corresponding to three different densities (146 kg/m3, 200 kg/m3 and 240 kg/m3).
We observed that with increasing density of the fibers there is an increase of hydraulic conductivity. The importance of the experimental results on permeability acquires greater relevance when compared to the values of hydraulic conductivity already known from the literature for different soils types.
In this study, special attention has been given to the value of hydraulic conductivity of this fiber, considering that in the framework of groundwater remediation strategies if the hydraulic conductivity in the barrier is lower than that of the surrounding aquifer, the plume may change its natural pathway, bypassing the barrier and veering towards larger hydraulic conductivity.

Reference

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