



Activated carbon amendment for in-situ remediation

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For the first time in Europe, a novel and innovative remediation technique is used in a field pilot study. This technique is amendment of the soil with two types of activated carbon (AC). Here, one pulverized AC (PAC, 50% < 15 μm and 3% > 150 μm) and one granular AC (GAC, 1.7-0.43 mm) is tested. The idea of this technique is that the added AC binds organic contaminants so strongly that they cannot be taken up in living organisms or transported to other environmental compartments. Laboratory studies with 2% (wt %) AC amendment to an urban soil reduced the freely dissolved pore water concentrations of PAH by 17% to 99% (Brändli et al. 2008).

Several parameters such as dissolved organic carbon (DOC), K, NO₂, NO₃, NH₄, PO₄ and PAH, are being measured in this field study. Plant growth and earthworm bioaccumulation tests were also carried out during the summer months. DOC showed a 70% reduction between untreated soil and soil with PAC about one year after the amendment. In the soil mixed with GAC, a 55% reduction could be measured. For K, a 40% lowering value was observed for the soil with GAC compared to no effect for the soil with PAC. NH₄ was reduced by 50% for both GAC and PAC amended soils compared to the untreated soil, whereas NO₂ and NO₃ increased with 2-4 times for the soil with GAC and no effect were seen for the soil with PAC. The freely dissolved PAH concentrations were reduced by 49-78% for the soil with GAC and 82-96% for the soil with PAC. The plant experiment showed best growth rate in the soil with GAC, followed by the untreated soil and least growth was measured on the PAC treated soil. The low growth rate seen in the soil with PAC may come from the fact that DOC and some other nutrients are also being sorbed to the PAC surface together with the organic pollutants and are thereby taken away from the biological cycle.

Amendment of soil with AC remediates the soil from organic contaminants when these pollutants are sorbed to the AC surface. This is an easy technique that can be performed to a relatively low cost. However, the AC particles may also sorb other constituents of the effluent water such as DOC and nutrients which in turn may lead to reduced plant growth rate. Therefore, the long-term effects of this amendment technique have to be studied more closely.

Reference

Rahel C. Brändli, Thomas Hartnik, Thomas Henriksen, Gerard Cornelissen, (2008) Sorption of native polycyclic aromatic hydrocarbons (PAH) to black carbon and amended activated carbon in soil, Chemosphere doi:10.1016/j.chemosphere.2008.08.034