Sorbent Enhanced Bioswales for Stormwater Treatment

Abstract:

High capacity organophilic sorbent media (Bio-Mix Osorb®) was evaluated for enhanced remediation of stormwater runoff pollutants. Bio-Mix Osorb is an organosilica-zero valent iron composite material that can absorb a wide range of organic contaminants. Osorb materials are based on sol-gel derived, hybrid organic-inorganic structures that have been nano-engineered to absorb organic molecules from air and water with high affinity and capacity. Osorb is hydrophobic and does not absorb water, but is effective at absorbing a wide range of organics from aqueous solution and gas streams. Swelling is reversible and the media acts as a buffer for contaminants within the soil and rhizosphere. Iron embedded in the organosilica is designed to hydrodehalogenate chlorinated organics absorbed by the media. Column scale experiments were used to measure the effectiveness for a range of contaminants. Biocompatibility studies were also conducted. A field-scale BioMix Osorb-enhanced bioretention system was constructed in spring 2012 at an urban industrial site in Ohio and evaluated the effectiveness of the Osorb amendments under typical and extreme urban runoff conditions. Influent and effluent of the bioretention system from various runoff events were monitored during a 1.5-yr study. The installed Osorb-enhanced bioretention system was effective in removing nutrients (41–99%) and herbicides-atrazine and 2,4-D (77– 99%), and heavy metals (99%) under elevated levels of pollution loading, demonstrating that the Osorb-enhanced bioretention system has the potential for being an effective best management practice for extreme urban runoff conditions. A second two-chamber bioswale was constructed at the College of Wooster in Spring 2011 and has been monitored in a similar fashion.