

Evaluation of low-cost media for sorption of organic pollutants in stormwater

Recent studies have shown that many organic compounds, including polycyclic aromatic hydrocarbons (PAHs) emitted through combustion and via petroleum sources, phthalate plasticizers and plastic additives such as alkylphenols, are found in stormwater at levels that exceed national and international water quality standards. This calls for efficient mitigation practices to reduce and eventually terminate the emission of these pollutants into stormwater and aquatic environments. Filtration of stormwater is one of the most promising technologies to remove particulate, colloidal and dissolved contaminants, provided that effective filtration and sorption materials are used.

The aim of this research was to use laboratory-based experiments to determine the removal capacity of some selected sorbents for organic pollutants. A variety of materials previously used for metal and oil sorption, including minerals, wood- and bark-based media, were examined in 24 h batch tests using synthetic stormwater, spiked with humic acids (representing dissolved organic matter) and seven different organic pollutants. The samples were then centrifuged and filtered, liquid-liquid extracted, and analyzed using gas chromatography-mass spectrometry.

As expected, the sorption tests showed that the minerals were ineffective for removing organic pollutants from stormwater. Despite its high water absorption capacity, cellulose sorbed organic contaminants only to a moderate degree. The bark-based media, however, were efficient sorbents. In general, the PAHs (90-95% of initial concentration removed) were more efficiently sorbed than alkylphenols (85-90%) and phthalates (75-85%) by bark. The results can be used as a guide in the selection of effective sorbents for the treatment of polluted stormwater in, for example, manhole filters, swales and rain gardens.