Removal of BTEX from Storm Water using Improved HDTMA Nano-Particle Enhanced Reactive Porous Concrete

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Storm water from parking lots, driveways, and gas stations is often contaminated with the aromatic compound benzene, toluene, ethylbenzene, and xylenes (BTEX) that are a fraction of gasoline. These BTEX compounds can have adverse health effects and cause environmental damage. Therefore, the removal of BTEX from runoff is an important requirement for effective storm water management. Porous concrete is an emerging technology for reducing the amount of runoff from paved areas. If these porous structures could be modified to remove storm water contaminants, they would be a valuable environmental tool. In this continuation of my research, improved nanoparticles were made by reacting zeolite-clay with a quaternary ammonium surfactant. The new nano-particles had a higher affinity for BTEX compounds than the previous nanoparticles and were more absorbable onto the calcium carbonate Portland concrete. Isotherm testing showed that the resulting nano-particles could adsorb 1,000 mg of BTEX per gram of nano-particles, which is 33% higher capacity than the previous nanoparticles. The 100 mg of nano-particles were adsorbed onto 0.5 cubic feet of concrete with various degrees of porosity, yielding reactive porous concretes that were capable of adsorbing BTEX from storm water. Column testing was conducted, and confirmed the improvement of the concrete for BTEX removal. The lower porosity concrete had the highest degree of BTEX removal. The nano-particles were added to 10 ft. x 5 ft. test plots which demonstrated the ability of this technology to be employed in the field.

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