The Filter for Dynamic Purification of Water from Oil Products

Nikiforova, Alena (School: State School #1080)

Petroleum derived products have the potential to cause an enormous harm to the biosphere and removal of these products from the ground water and run-off water presents one of the most critical issues for environmental remediation. At present there are several methods of water filtration from these contaminants but they are all static in nature. The purpose of the project was to create hydrophobic, inorganic carbon-based filter material to enable dynamic water purification from oil substances. The hypothesis we made is that porous hydrophobic oleophilic media can be able to purify water dynamically. The main advantage of this idea is the ability to remove the contaminants under dynamic conditions. We selected chamotte, an inorganic porous material, as the substrate for our filter. We then developed a method to deposit a thin layer of hydrophobic carbon-based coating via pyrolysis of mineral oil. These porous materials absorbed the oil very easily and at the same time remained floating on the water surface. The investigation using scanning electron microscope (SEM) revealed that all of the inner and outer surfaces have been coated not only with a carbon layer, but also with the nanotubes and needle-like nanostructures. A set-up to study the process of dynamic removal of the oil contamination from water surface was built using hydrophobic carbon-based filter materials obtained with use of the described process. The operability of the filter was tested at this setup. The method presented in this project allows to obtain material for fast and effective removal of the petroleum-based contamination while operating in the continuous mode. Filter element developed in this project is reusable and can be regenerated.

Awards Won: