Water and Soil Decontamination from Mixed Contaminants

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Soil and water contamination caused by human activity is a major threat to the environment, human health and quality of life. There are many sources of land pollution, which include industrial, agricultural and domestic activities. Potentially the most dangerous pollutants are xenobiotics (e.g. human-made chemicals). Toxic metals/metalloids (Cd, Cu, Pb, Zn, Hg, Se, As, Cr) and emerging organic contaminants (polyaromatic hydrocarbons (PAHs), persistent organic pollutants (POPs), petroleum hydrocarbons, synthetic dyes, pesticides and herbicides) are the most abundant and widespread contaminants worldwide. Often they are found together in the same contaminated site and this creates a problem as toxic metals interfere with the degradation of organics.

Thus developing a comprehensive technology for the remediation of contaminated land and water treatment from representative toxic metals, POPs and synthetic dyes became an issue of today. Novel materials were developed by incorporating Fe based nanoparticles (Fe NPs) on activated carbon (AC) matrices, in such a way that the AC retained their ability to remove organics and metals, while the incorporated Fe NPs efficiently remove metalloids such as arsenic, chromium, etc. Moreover, the biodegradation of the contaminants of real soil samples by indigenous microorganisms was studied under aerobic conditions at room temperature using laboratory glass columns. Two soil samples were collected from the storage area of wooden railway sleepers impregnated by oil preservatives. Bacterial degradation activity was monitored by respirometry via the rate of O_2 consumption and CO_2 production. The biodegradation experiments have been carried out in the laboratory columns for 20 and 50 days, with no inoculation of bacteria, only with the use of the original bacterial strains. Soil samples were humidified with water and an inorganic nutrient solution to increase the degradation rate. The results showed that the use of indigenous microorganisms could be considered as a potential tool for the biodegradation.

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