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## Adsorptive bioremediation of petroleum-contaminated soils

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Despite on the evident privilege of bioremediation of petroleum-contaminated soils, possibilities of this approach are restricted due to high toxicity and bad properties of the contaminated soils, leading to poor adaptation of indigenous and/or inoculated degrading microorganisms and plants in highly contaminated soils. The main subject of this presentation is to discuss conception of adsorptive bioremediation for recultivation of petroleum-contaminated soils. The experiments on adsorptive bioremediation were carried out in semi field conditions with various tips of mineral soil spiked with crude oil or some products (diesel fuel and spent motor oil) in the initial concentrations 50, 100 and 150 g kg<sup>-1</sup>. The spiked soils were treated through regular *in situ* bioremediation technique. In addition to mineral fertilizers, commercial bio preparations were added separately or in combination with natural adsorbents of 3 classes: Mineral (kaolinite, zeolite, vermiculite, diatomite), organic (peat and Spill-Sorb) and carbonic (activated carbon and biochar). It was indicated, that optimal doses of the adsorbents (from 0.2% to 6% depending on adsorbent as well as on form and rate of the contaminants) accelerated microbial degradation of petroleum hydrocarbons (PHC) in the studied contaminated soils. The positive effect of the adsorbents was shown to be explained by two main mechanisms: 1) reduction of soil toxicity to degrading microorganisms and plants due to mostly reversible adsorption of toxic contaminants (some PHC and especially their oxidized products) and 2) reduction of soil hydrophobicity followed by improving water holding capacity and porosity of the soils. Some adsorbents (e.g., activated carbon and biochar) reduce leaching of those toxic contaminants to ground waters. Finally, there was not accumulation of significant amounts of PAHs in the treated soils. Thus, the use of some natural adsorbents may substantially extend the possibility of *in-situ* bioremediation of petroleum-contaminated soils.

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