

Enhanced Remediation of Recalcitrant Hydrocarbons in Aged Compost Soils

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A combined method of chemical oxidation followed by enhanced bioremediation by means of an oxygen releasing compound has been applied to recalcitrant hydrocarbons of two compost piles. Soil studies show a high content of NOM and water and a structure of mainly silt. The history of both sites shows an efficient removal of biodegradable organic matter but a considerable amount of recalcitrant petroleum hydrocarbons left, mainly motor oil, which do not degrade any further.

Chemical oxidation has been carried out by means of a modified Fenton treatment named heterogeneous catalysis. This form of treatment is based on the use of the catalyst as a solid phase and it is known to be effective at a pH range from 3 to 7. Due to the natural high content of mineral iron in sample soils, this treatment has been considered as the most feasible. The enhancement of natural bioremediation has been done by two different oxygen releasing compounds, *ORC*[®]-*Advance* by Regenox and *Velox*[®] by Nordkalk.

40 g of contaminated soil were treated in batch reactors for 72 hours at different H₂O₂ ratios. Afterwards, soils were mixed with the oxygen releasing compound *ORC*[®]-*Advance* at a ratio of 0,02g of *ORC*[®]-*Advance* per 1g of soil. The samples were kept moisturized for three weeks and afterwards analyzed for hydrocarbon content and BOD₇. On the other hand, two equal samples of contaminated soil were mixed whether with *ORC*[®]-*Advance* or *Velox*[®] in order to compare treatment capability.

Results of hydrocarbon content show an effective degradation by the Fenton treatment. A higher amount of hydrocarbons is found when samples are analyzed after the oxygen releasing compound treatment. This demonstrates that changes in matrix have occurred leading to a less attached contamination to the substrate and, subsequently, further solid-liquid extraction can be achieved. Moreover, results show that the higher the amount of NOM in the original sample, the worst the reduction is. Results of BOD₇ show increase in almost all the treated samples, which evidences an enhancement of the biodegradability of the recalcitrant hydrocarbons after Fenton and oxygen releasing compound treatment. Results of comparison between *ORC*[®]-*Advance* and *Velox*[®] manifest a higher reduction of hydrocarbons in the case of *ORC*[®]-*Advance*. This can be caused due to the higher percentage of CaO₂ and the higher oxygen releasing capability of this product.

It can be concluded that increase of biodegradability is possible at certain ratios of H₂O₂ by means of Fenton treatment due to both oxidation of contaminants and changes in matrix and that oxygen releasing compounds enhance the posterior degradation.