282h Assessment of the Rhizosphere Effect in Phytoremediation of Pahs

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The plant root and plant-produced compounds or root exudates provide a local environment rich in nutrients and enzymes for enhanced microbial population and activity in the soil zone near the root surface - the rhizosphere. Mathematical modeling suggests that the spatial extent of the rhizosphere is an important parameter in the degradation of immobile constituents in petroleum-contaminated soil by phytoremediation based on rhizodegradation. The objective of the present study is to develop an accurate and non-destructive approach to quantify the rhizosphere spatial extent in phytoremediation experiments. The rhizosphere extent is calculated from a digitized high-resolution image of the root zone during phytoremediation of a fluorescent pyrene or phenanthrene thin film. This calculation is based upon differentiating the luminescent intensity between the rhizosphere zone and bulk soil zone. Images show the rhizosphere effect, and provide a quantifiable measure of the extent of the rhizosphere volume. Quantitation of the luminescent intensity also provides for direct measurement of the contaminant mass in the rhizosphere as a function of time, providing information for estimation of rhizodegradation rate constants. The results of this work should lead to a more accurate model that can be used to improve phytoremediation management.