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Soil slurry reactors for the assessment of contaminant biodegradation

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Slurry reactors are frequently used in the assessment of feasibility of biodegradation in natural soil systems. The rate of contaminant removal is usually quantified by zero- or first-order kinetics decay constants. The significance of such constants for the evaluation of removal rate in the field could be questioned because the slurry reactor is a water-saturated, well-stirred system without resemblance with an unsaturated fixed bed of soil. Nevertheless, a kinetic study with soil slurry reactors can still be useful by means of only slightly more sophisticated kinetic models than zero-/first-order decay. The use of kinetic models taking into account the role of degrading biomass, even in the absence of reliable experimental methods for its quantification, provides further insight into the effect of nutrient additions. A real acceleration of biodegradation processes is obtained only when the degrading biomass is in the growth condition. The apparent change in contaminant removal course can be useful to diagnose biomass growth without direct biomass measurement.
Even though molecular biology techniques are effective to assess the presence of potentially degrading microorganism in a "viable-but-nonculturable" state, the attainment of conditions for growth is still important to the development of enhanced remediation techniques.
The methodology is illustrated with reference to data gathered for two test sites, Oslo airport Gardermoen in Norway (continuous contamination by aircraft deicing fluids) and the Trecate site in Italy (aged contamination by crude oil spill).
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