

ENHANCED RHIZODEGRADATION OF MUNITIONS EXPLOSIVES AND DEGRADATES BY SELECTED NATIVE GRASS SPECIES

Han Yang

Drs. John Yang, Chung-ho Lin, and Stephen Anderson, Thesis Advisors

ABSTRACT

TNT (2,4,6-trinitrotoluene) and RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine) are the two most widespread explosives in the world. The manufacture, use and disposal of explosives can result in environmental contamination, which has been reported as a threat to human health and ecosystems. Compared to highly expensive and inefficiently conventional remediation methods, phytoremediation has been considered as a cost-effective way to clean up contaminated sites. The objectives of this research are to: (1) evaluate the degradation kinetics of TNT and RDX in the rhizospheres of two selected native grass species; (2) investigate the synergic effects of TNT degradation in both rhizospheres by inoculating with known explosive degraders; and (3) investigate the effects of living plants on sustaining TNT degrader population (*pnrA* gene) and TNT degradation activities. Results suggested that the TNT was rapidly degraded into its major metabolites in both rhizospheres and control soil; the degradation of the TNT metabolites was significantly enhanced in the rhizosphere soils as compared with the control. However, the mineralization of TNT in all the treatments was limited (< 5%). In contrast, the degradation of RDX and its metabolites in the rhizosphere soils were significantly enhanced over the control. More than 13% RDX was mineralized in rhizosphere soils as compared to 5% in the control. Overall, EG appeared to be more effective for RDX degradation, while SW to be more suitable for TNT degradation. Inoculation of TNT degrader *P. putida* KT2440 to SW could enhance TNT degradation as compared to use SW alone.