ABSTRACT

Hong, Lee-Yan. Ph.D., Purdue University, August 2006. Remediation of Cyanide-Contaminated Soil Using Plants. Major Professor: M. Katherine Banks.

Phytoremediation had been proven to be a cost-effective technology for removing hazardous contaminants from soil. This dissertation research was designed to evaluate the impacts of plant establishment, biodegradation, and plant-microbe interactions on cyanide-contaminated soil. Two cyanogenic plants (*Sorghum bicolor* and *Linum usitatissimum*) and one non-cyanogenic plant (*Panicum vigatum*) were selected for remediation of iron-cyanide (Prussian blue) contaminated soil. The biodegradation of hydrogen cyanide by rhizosphere microorganisms also was assessed.

The cyanide degradation ability of cyanogenic plants was anticipated to be significantly higher than non-cyanogenic plants. As shown in results from a greenhouse study, there was an 85% reduction of total cyanide in soil over the 200-day experimental period by two cyanogenic plants. By evaluating the degradation pathway of ^{14}C-Prussian blue in a chamber study, it was verified that radio-labeled carbon dioxide was released as one of the end-products. *Rhodococcus sp., Billus sp., Rhizobium sp., Arthrobacter sp., Pseudomonas sp.,* and *Microbacterium sp.* were six culturable microorganisms found in the rhizosphere microbial community. The cyanide degradation pathway of *Rhodococcus sp., Bacillus sp.,* and *Microbaterium sp.* was assessed, and the end-products (carbon dioxide and ammonia) were released through cyanide oxidative reactions. Results from

this research indicate that phytoremediation of cyanide contaminated soil is a feasible treatment approach.