Bioremediation and Sustainable Environmental Technologies—2017. Fourth International Symposium on Bioremediation and Sustainable Environmental Technologies (Miami, FL; May 2017). ©2017 Battelle Memorial Institute, Columbus, OH, www.battelle.org/biosymp. A. Barton and S. Rosansky (Chairs)

Influence of Capping Material Type upon Biodegradation of Polycyclic Aromatic Hydrocarbons in Sediments

Giovanna Pagnozzi (giovanna.pagnozzi@ttu.edu),
Kayleigh Millerick (kayleigh.millerick@ttu.edu), and Danny Reible (danny.reible@ttu.edu)
(Texas Tech University, Lubbock, TX, USA)

Background/Objectives. Bioactive capping technologies couple conventional capping strategies with biotransformation processes to sequester and degrade hydrophobic contaminants within sediment systems. Previous data indicated that biological degradation of naphthalene (a model PAH) occurs in microcosms representing conditions observed in capping environments. However, the relationship between the rate and extent of PAH biotransformation and capping material characteristics is unknown.

The goal of this study is to investigate the extent to which biological activity may be dependent on specific characteristics of sediment cap in model systems. The specific aims were to: i) compare rates of naphthalene degradation in model capping systems when capping material and redox zone are varied; ii) identify characteristics of capping materials that can affect biotransformation of contaminants in sediment caps; and iii) identify relationships between quantities of capping material and observed biological activity.

Approach/Activities. Screening experiments consisted of microcosms prepared with different capping materials (sand, organoclay, and GAC), media, electron acceptor, and pore water/microbial communities enriched from river sediments collected from a river adjacent to a former manufactured gas plant. These were monitored for 100 days. Subsequent experiments utilized virgin GAC of incremental quantities, and these studies were conducted under aerobic conditions. Concentrations of naphthalene (model PAH) and *nahAc* (dioxygenase gene associated with aerobic transformation of PAHs) were monitored in GAC microcosms for 14 days. Experimental data were collected and modeled, and the relative kinetic rates were used to compare the extent to which quantity and material type influenced naphthalene degradation.

Results/Lesson learned. Sediment caps can influence biological degradation of PAHs, but the rate and extent of naphthalene degradation is highly dependent upon the growth support medium (capping material). Compared with other materials, GAC promotes higher naphthalene degradation rates and copy numbers of *nahAc* gene. Data also suggest that naphthalene degradation activity is proportional to GAC quantity, suggesting a system that can be modulated to sustain bioactivity over long periods of time.