Terra Systems Core Competencies

Treatability Study Laboratory

Terra Systems has conducted over 200 treatability studies and is one of the most experienced treatability laboratories. Typical treatability studies and lab services include:

- In Situ Anaerobic Bioremediation Microcosm Studies of Chlorinated Solvents
- In Situ Chemical Oxidation Studies
- In Situ Chemical Reductions Studies with zero valent iron (ZVI) or other reductants
- Column Studies for Bioremediation
- In Situ Aerobic Bioremediation Studies of Petroleum
- Monitored Natural Attenuation Studies of Chlorinated Solvents and/or Petroleum Hydrocarbons
- Petroleum Hydrocarbon Utilizer Counts
- Total Heterotrophic Bacteria Plate Counts
- Inorganic Nutrient Additions
- Oxygen Sources from Sparged Oxygen, Slow Release Oxygen Compounds, or Hydrogen Peroxide
- pH Control

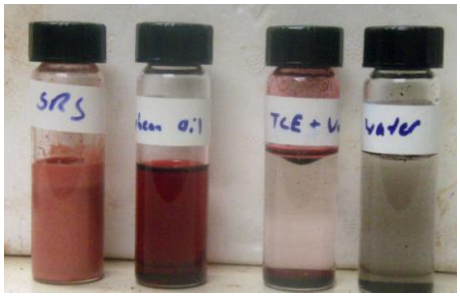
pH control at anaerobic sites is a key driver of success with an optimal pH range between 6.5 and 8.5. The reductive dechlorination process produces acidic conditions. To achieve optimal pH conditions; we recommend that the pH buffering capacity of the site's soil and groundwater be determined. We determine the quantity of several potential amendments to neutralize the acidity of the groundwater at a potential bioremediation site, which include.

1. sodium bicarbonate
2. calcium carbonate
3. sodium carbonate or soda ash
4. magnesium oxide

The objective is to select a buffering agent that can be added to increase the groundwater pH and maintain neutral conditions needed for biological reductive dechlorination. The criteria for selecting the pH buffering agent are the following:

1. Increases the pH to between 7 and 9
2. Does not exceed pH 10
3. The lowest price (either the lowest cost per unit or lower price for a larger quantity)
4. Is relatively soluble or has fine particles that can be suspended in the chase water

The Treatability Lab supports new product development, which includes formulation design and testing.



Recent products, which were designed in conjunction with real customer site problems include:

1. **SRS®-Z** emulsified vegetable oil and ZVI for improved injectability and radius of influence
2. **SRS®-M** for mixed chlorinated solvent and Cr^{6+} plumes
3. **SRS®-FR** for high groundwater flow rate aquifers
4. **SRS®-NR** for nitrate plumes in high groundwater flow rate aquifers
5. **SRS®-STA** with a shear thinning agent for heterogenous aquifers

Michael Lee, Ph.D. has over 30 years of experience conducting treatability studies and provided oversight for the first successful anaerobic bioaugmentation project for TCE and cDCE at Dover AFB, DE in 1997. To discuss a potential treatability study with Dr. Mike Lee or to obtain a '***sample***" treatability report, call him at the lab at **302-798-9553** or email him at mlee@terrasystems.net.

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