WHEN KNOWING "mg/kg" ISN'T ENOUGH

NEWS FROM PRIMA ENVIRONMENTAL, INC.

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"Happy is he who gets to know the reasons for things. "

-Virgil
(70-19 BCE) Roman poet

"Every experiment proves something.
If it doesn't prove what you wanted it to prove, it proves something else. "

-Anonymous

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PRIMA ENVIRONMENTAL INC.
An Applied Sciences and Technology Laboratory

IN THIS ISSUE

We hope your new year is starting out well! Our last newsletter served as an update and reconnection for those of you who have known us for a while and also as an introduction for those of you we've recently met or hope to meet soon. In this issue, we get back to business: dirty dirt!

Soil Oxidant Demand (SOD)

Bench Testing: There's More than Meets the Eye

In-House Research Ensures It's Right

Soil Oxidant Demand (SOD)

Soil oxidant demand (SOD) is the amount of oxidant (permanganate, persulfate, or ozone) consumed by soil. It can be an important factor in evaluating the cost of in situ chemical oxidation, since it can offer a first approximation of the amount of oxidant that may be required.

SOD is measured by combining soil, oxidant and water, and then measuring the oxidant concentration over time. The oxidant may be consumed by natural organic matter, reduced mineral species, or by contaminants. If SOD is measured on clean, uncontaminated soil, it is often referred to as the "natural oxidant demand" or "NOD".

SOD is both site-specific and oxidant-specific. For instance, sands often have a lower SOD than clays or highly organic soils. A soil with a high permanganate SOD often indicates a high persulfate or ozone SOD. However, it is not possible to calculate the persulfate or ozone SOD from permanganate results because the mechanism by which the oxidants are consumed is different for each oxidant. In addition, several oxidant doses should be used because SOD often depends upon the initial concentration of oxidant, as illustrated in Figure 1 for permanganate.

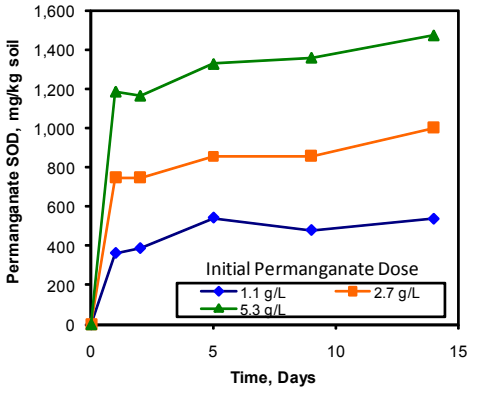


Figure 1. Permanganate SOD increases with increased oxidant dose.

While SOD is a useful tool for estimating the amount of oxidant that might be needed to remediate a site, it must be emphasized that it says *nothing* about whether or not a contaminant can be destroyed by the oxidant. For example, benzene-impacted soil may have a high permanganate SOD, but permanganate will not destroy the benzene so other oxidants should be considered.

Bench Testing

There's More than Meets the Eye

What's so hard about mixing soil, groundwater, and permanganate? Nothing and everything. Adding an oxidant to contaminated soil and groundwater is easy—anyone can do it—but interpreting the results may be difficult or impossible if the test is poorly designed. For example:

- Collecting off-gases when evaluating ozone for Volatile Organic Compound (VOC) destruction is vital to understanding whether VOC removal from water is due to destruction or stripping.
- Designing the experiment with too much headspace may also make it difficult to determine whether contaminants are chemically or biologically degraded.
- Having different ratios of soil, water and headspace among the controls and treatments may complicate calculations.

A solid understanding of the contaminants also ensures a well-designed study. For example, pentachlorophenol (PCP) is less soluble at low pH, so a low pH control should be run if evaluating acidic reagents or reagents that can generate acid. Secondary parameters - such as chloride if evaluating PCP - should be measured whenever possible to support conclusions that contaminant losses are due to destruction rather than physical phenomena.

PRIMA has been designing and conducting bench tests for over 11 years and we have the experience to ensure studies are well-designed and purposeful. The revealing results, detailed analyses and expert recommendations we deliver to our clients allow them to make well-informed decisions.

In-House Research

Ensures It's Right

PRIMA often deals with concentrations of reagents that are higher than most analytical labs typically encounter. Our experienced scientists personally review all test data and perform due diligence to ensure all results are consistent and make sense in terms of the overall study. When PRIMA encounters results that do not fit the expected pattern, PRIMA conducts its own research to be sure that the results of all tests and analyses are accurate.

For instance, because the potential for in situ chemical oxidation to generate Cr(VI) is a common component of bench testing, PRIMA has evaluated the effect of residual oxidants on the accuracy of Cr(VI) measurements. The accuracy of reported Cr(VI) results is crucial since erroneous data could eliminate an effective remediation option or include a Cr(VI)-generating technology without proper precautions.

Because of PRIMA's in-house research and expertise, we are confident that the results we provide are of the highest quality and we can quickly and easily support our conclusions.

Out and About

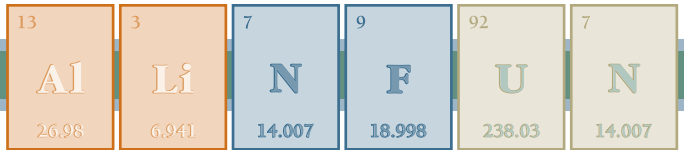
For those of you who visited us at **Brownfields 2009**, it was a pleasure. We've posted photos of our booth on our website for anyone interested.

Upcoming Events

Dr. Cindy Schreier, PRIMA's President and Chief Scientist, enjoys opportunities to educate people on site remediation technologies. You can find her at:

April 1 GRA Solvent Release Symposium
Santa Clara, CA www.grac.org

May 24-27 Battelle Remediation of Chlorinated and Recalcitrant Compounds
Poster Group 1 Session D2
Monterey, CA www.battelle.org



Did you hear about the industrialist who had a huge chloroform spill at his factory?

His business went insolvent.

"Scale keeps forming inside the kettle", complained Tom, recalcitrantly.

"Take plenty of the dark purple solution", Tom offered, manganimously.

"This old pipe is rusty", said Tom, ironically.

Q: What's the most important thing to learn in chemistry?

A: Never lick the spoon.

-ScienceJokes.com

Got a better one? Please send your joke, pun, quote, or piece of trivia to us and if we use it in a newsletter, we will give you the credit you so richly deserve as well as a Starbucks gift card. To make a submission, please visit our website, go to the Newsletters page and click on AlLiNFUN.