Society of Hispanic Professional Engineers

Call for Technical Papers

Student Technical Paper Competition

NTCC 2006

Lake Buena Vista, FL
January 4 - 8, 2006

Important Dates:

October 21, 2005
Abstract Submission Deadline

October 28, 2005
Notification of Accepted Abstracts

November 28, 2005
Final Technical Paper Submission Deadline

For more information contact:
Dr. Olivia A. Graeve (oagraeve@unr.edu)

National Technical and Career Conference
Lake Buena Vista, FL
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MEMORANDUM

TO: SHPE Students

FROM: Dr. Olivia A. Graeve
NTCC 2006 Student Technical Paper Competition Chair

Date: August 1, 2005

Subject: Call for Papers – NTCC 2006 Student Technical Paper Competition

SHPE would like to invite all graduate and undergraduate students to submit technical paper abstracts for consideration to the NTCC 2006 Student Technical Paper Competition.

ELIGIBILITY:

- **Must be a SHPE Member**
- Must be a graduate or undergraduate student.
- The topic of the technical paper must be related to the technical fields of engineering and science.

OVERVIEW OF TECHNICAL PAPER COMPETITION:

1. Technical paper abstracts must be submitted by October 21, 2005 via email to oagraeve@unr.edu.
2. Participants will be notified of acceptance of abstract by October 28, 2005.
3. Selected participants must complete and submit their final technical papers by November 28, 2005.
4. Selected participants will present their technical papers during the NTCC 2006 Student Technical Paper Competition in Lake Buena Vista, FL.
5. A panel of professionals will judge the presentations and make final decisions on the winners.

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SELECTION CRITERIA: Abstracts and technical papers will be reviewed and judged by a committee on the basis of the following criteria:s

1. **Originality**
2. **Social impact**
3. **Completeness**

Notes: It is the author's responsibility to obtain all requisite permissions to release the information presented in the technical paper. Papers presented at this conference must not be classified.

AWARDS:

- Monetary awards will be presented to the first-, second-, and third-prize winners in each category at the conference.
- All technical paper finalists selected to participate in the competition will receive a COMPLIMENTARY conference registration fee.

ABSTRACT GUIDELINES:

1. All abstracts are limited to one 8.5 x 11 inch (letter-size) page.
2. Minimum font is 10-point.

The abstract must include the following:

1. Title of paper
2. Name (underlined), affiliation, mailing address, phone number, and e-mail address of presenting author.
3. Names and affiliations of co-authors.
4. Main text of abstract

Note: Abstracts with incomplete information will not be considered for the competition.

CONTACT INFORMATION:

Dr. Olivia A. Graeve
University of Nevada, Reno
oagraeve@unr.edu
(775) 784-7098

Title

Reactive Ferrous Sulfide/Ferric Oxide Multi-Layer Films for Remediation of Arsenic Contaminated Groundwater

Presenting Author

Tanya J. Gallegos,[#*] Kim F. Hayes, and Linda M. Abriola[**]

Addresses

[*] University of Michigan, Department of Civil and Environmental Engineering
1351 Beal Avenue, Ann Arbor, MI 48109
[**] Tufts University, College of Engineering

Social Impact

Arsenic contamination of groundwater is a widespread problem affecting aquifers in the United States, as well as abroad. Recent strengthening of the US EPA Maximum Contaminant Level (MCL) for arsenic has prompted the need for technology capable of removing both the oxidized and reduced forms of arsenic (arsenite and arsenate, respectively) from solution. In particular, trivalent arsenite or As(III), the more persistent and toxic form in the anoxic groundwater zones, is the most difficult to remove from solution. Although some iron oxides, such as ferrihydrite, have been effective in removing As(III) from solution at circumneutral pH, these oxides have a tendency to dissolve when reducing conditions prevail in groundwater releasing the arsenic back into solution. However, iron sulfide minerals such as troilite, pyrite and the amorphous iron sulfide have demonstrated effective uptake of As(III) in batch solutions at high pH. Applications of reduced iron sulfides are currently under investigation for As(III) sequestration for in-situ subsurface permeable reactive barriers. Direct application, however, in such a flow-through system is dependent not only upon ability to synthesize the reactive media on a large-scale industrial level but also at various ranges of particle sizes.

Objective / Hypothesis

Experiment

The purpose of this study was to develop reactive iron sulfide porous media in a range of particle sizes for remediation of As(III)-contaminated groundwater. A method was developed to produce multilayer films on quartz sand consisting of both an iron oxide layer and a protective layer of iron sulfide for uptake of As(III) under reducing conditions. Additionally, the macroscopic behavior of the films were characterized in the presence of As(III) with respect to variations in time, ionic strength, pH and initial total As(III) concentrations. This information was used to determine the likely mechanisms and optimal conditions for effective As(III) uptake.

Results

The results indicate that iron sulfide/oxide coated sand removes As(III) from solution from pH 3 to pH 11. As(III) sorption onto iron sulfide/oxide coated sand increases with increasing pH, reaching maximum removal between pH 7 and 9. As(III) removal at low pH (below pH 5) is constant indicating a different removal mechanism. Isotherm studies show that at low concentrations, removal follows Langmuir adsorption behavior whereby sorption levels off with increasing solution concentration of As(III). As(III) sorption, however, abruptly converts to linear behavior at high concentrations, possibly attributed to the saturation of the monolayer and subsequent multilayer surface precipitation. Ionic strength effects were assessed by comparing pH edge data developed for three different concentrations of NaCl background electrolyte solution. Increases in ionic strength enhance the removal of As(III) from solution, suggesting possible inner-sphere surface complexation removal mechanisms.

Conclusion

Information gathered in this study can be used to develop surface complexation models to describe and predict reactivity of As(III) in the presence of iron sulfide/oxide coated sands in anoxic regions. The results indicate that iron sulfide/oxide coated sands provide a feasible reactive medium for implementation in subsurface permeable reactive barriers.

[#] Corresponding Author:
E-mail: tgallego@umich.edu, Telephone: (734) 936-3052, Fax: (734) 763-2275