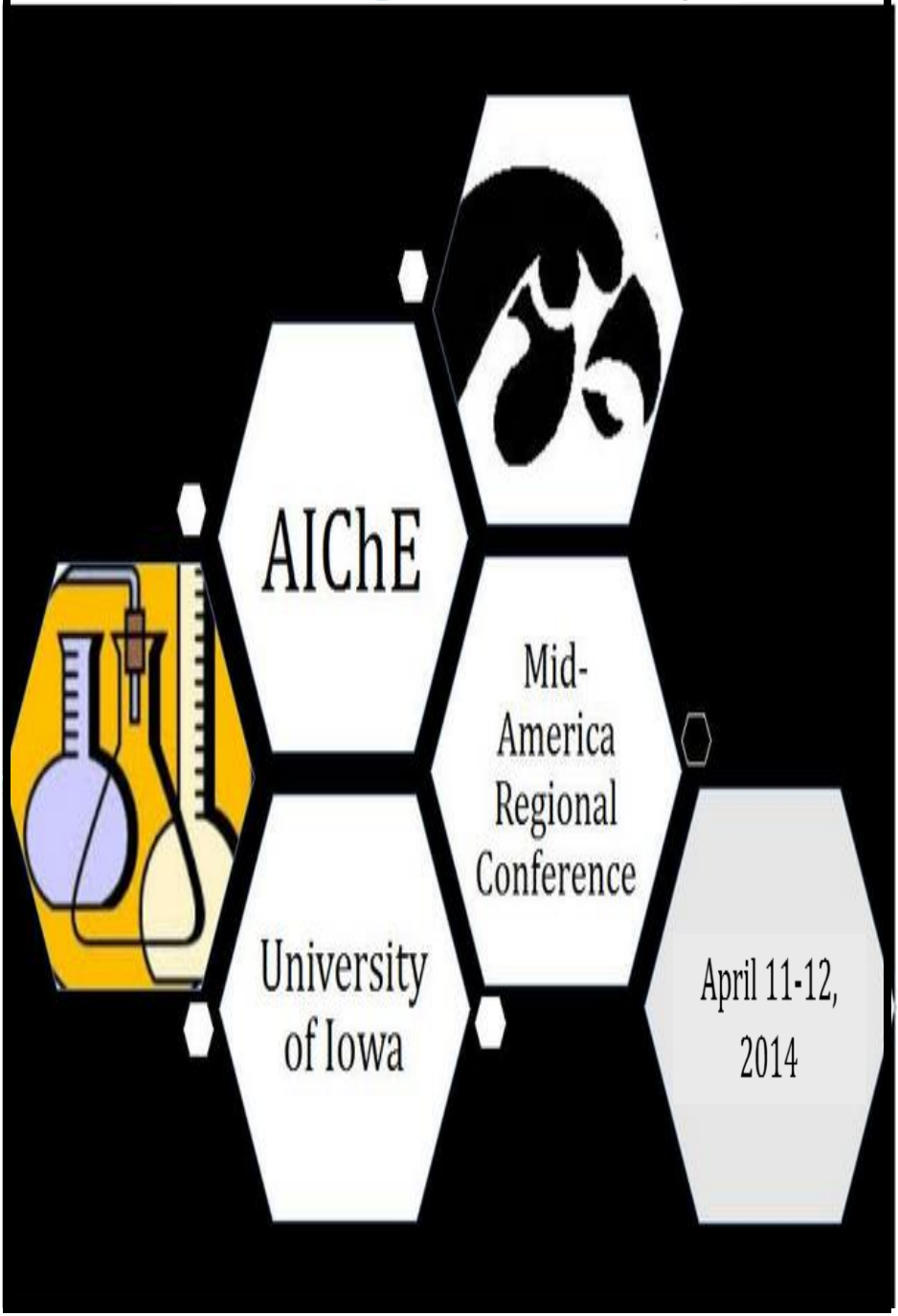
AIChE

The Global Home of Chemical Engineers



Maps

Figure 1. Directions from Sheraton Hotel to engineering building

Address of engineering building:

103 S. Capitol St, Iowa City, IA 52242

Address of Sheraton Hotel

210 S Dubuque St, Iowa City, IA 52240

* Exit Northside of Sheraton Hotel to Pedestrian Mall.
* Take left towards Clinton St. and cross the street.
* Fastest route is to walk through Old Capitol Mall
  or can take a right on Clinton St.
* Take left on Washington St. with destination on left.

Maps

Figure 2. Directions from Sheraton Hotel to Field House

Address of Field House:

225 S Grand Ave, Iowa City, Iowa, 52242

Address of Sheraton Hotel

210 S Dubuque St, Iowa City, IA 52240

* Exit Sheraton Hotel and follow Dubuque St. to Burlington St.

* Take right on Burlington St. till reaching roundabout.

* Arrive at destination.

Contact Information

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Schedule

Friday, April 11th

5-9 p.m.: Seamans Center: 2nd Floor Main Lobby

* Registration/Check-In

6-9 p.m.: Seamans Center: 2nd Floor Main Lobby

* ChemE Car Safety Check
* ChemE Car Poster Competition
* Graduate School Fair
* Executive Student Committee
* Young Professionals

Schedule

Saturday, April 12th

Breakfast will be provided by the Sheraton

8-11 a.m.: University of Iowa Field House: Main Deck Gym

* ChemE Car Competition
* Registration/Check-In
* **Teams please arrive at 7:30 a.m.**

11:30-12:30 p.m.: Seamans Center: 2nd Floor Lobby

* Lunch

11:30-12:30 p.m.: Seamans Center: 3210

* Presidents & Advisors Meeting (bring lunch to the meeting)

12:30-3pm: Seamans Center: 2217, 2229, 3505

* Student Research Competition
* Refer to "Student Research Competition"
* **Participants please arrive at 12:15 p.m.**

3-5 p.m.: Seamans Center: 2217, 2229, 3505

* ChemE Jeopardy
* Refer to "ChemE Jeopardy"

5-5:30 p.m.: Seamans Center: 3210

* Future Host Meeting

6:30-8:30 p.m.: Sheraton Banquet Room

* Banquet
* Keynote speaker
* Entertainment

Student Research Competition

Room 2217			
12:40	Adam Avoian	OU	Opening of gamma-valerolactone
1:00	Alex Moix	UARK	Carbon dioxide gas delivery
1:20	Catherine S.	UI	Thymidylate Synthase
1:40	David Francis	NU	Engineering of nanoparticles
2:00	German Parada	ISU	Synthesis of Magnetite
2:20	Hailey Dunsworth	UARK	Reverse Electrodialysis

Room 2229			
12:40	Carol Abraham	OSU	Tissue Regeneration
1:00	Alexandar Long	OU	Transalkylation of anisole
1:20	Haley Cleous	UARK	Recycling wastewater
1:40	Jacob Young	UI	Flammable Parameters
2:00	John Dominick	UARK	Development of TSI
2:20	Kaylee Smith	UARK	Targeted drug delivery

Room 3505			
12:40	Lauren Rogers	UARK	Modulating amyloid beta
1:00	Robert Tempel	UI	Effect of fumed silica
1:20	Andrew Lambeth	OU	Enhance the distillation yield
1:40	Brian Li	OU	Water-oil pickering emulsions
2:00	Supriya Thote	UARK	Biodiesel from fatty acids
2:20	Valerie Loayza	UARK	Microspheres to improve ELISA

ChemE Jeopardy

Preliminary round begins at 3:00 p.m.

Room 2217
Methanators (NU) The Classy Cyclones (ISU) Herky's Heroes (UI)

Room 2229
The Scarlets (NU) Fully Developed Turbulent Flow (UI) The name's Bond, Ionic Bond. Taken Not Shared (Mizzou)

Room 3505
MIZ! What is ZOU? (Mizzou) HOGS (UARK) What is … Jeopardy? (KSU)

Championship round will begin in room 3505, ten minutes following the conclusion of the preliminary round and will include the winners of preliminary round.

ChemE Car Participants

Cheat to Win (OU)

The Cyclone (ISU)

The Stinger (ISU)

The Unstated Assumptions (TU)

3rd Place (NU)

Free Masons (NU)

Champster (UI)

Stella (Mizzou)

The Hours Strikes Twelve (Missouri S&T)

Happy Little Accident (KSU)

The Struggle Bus (KSU)

The Dang Car (OSU)

Z Purple Haze (TU)

The Dark Knight (OSU)

The Angry Unicorn (OSU)

Keynote Speaker:

Elizabeth Bernard

Litigation Counsel at Google

J.D. Washington University

B.S.E University of Iowa

Paper Abstracts

Name: Adam Avoian
School: Oklahoma, University of
Title: Ring-opening of gamma-valerolactone using Ru-based catalysts on varying support

Abstract:

Gamma-valerolactone (GVL) is one compound that is being investigated with potential to serve as an efficient source of fuel and fuel additives. It is a stable and non-toxic compound and has been proposed for use as solvent and as a fuel additive itself, in addition to other applications. It is easily produced from levulinic acid (LA), a compound obtained directly from cellulosic biomass. Due to these factors, it is reasonable to suspect that future increased GVL production will precipitate a drop in its cost, increasing its attractiveness as an inexpensive precursor to upgraded, higher-value fuels.

GVL can be hydrogenated to generate a variety of products. One reaction pathway produces 1,4 pentanediol (1,4 PEd) by hydrogenation and ring opening and can produce methyltetrahydrofuran (MTHF) either through a 1,4 PEd intermediate that is then esterified or through a single hydrogenation step. Another pathway opens the ring to yield pentenoic acid, which is then quickly hydrogenated to pentanoic acid. MTHF is used as a fuel additive, and pentanoic acid can be ketonized into liquid fuels of higher molecular weight. Metal-based catalysts from groups 7-11 are a common choice for hydrogenation, and ruthenium has been shown to be particularly active with regards to GVL. Bifunctional catalysts comprised of metal on an acidic support have proved to be beneficial in maximizing conversion.

This research seeks to compare the catalytic activity of 5 wt.% Ru on non-acidic carbon support with that of 5 wt.% Ru on HY zeolite hydrophobized with ethyltrichlorosilane (HY30-ETS), a moderately acidic support. HY30 has been hydrophobized to prevent catalyst degradation at the high operating temperatures necessary for GVL conversion. Investigations are carried out in a liquid-phase batch reactor under 1000 psi H2 at temperatures from 200-250 °C. Catalyst mass is varied from 100-250 mg in a total liquid volume of 100 mL with 15% GVL by weight. Initial investigations using Ru/C show GVL conversions ranging from 15-30% with a MTHF as the major product Investigations are underway to elucidate the activity of Ru/HY30-ETS for GVL ring opening in emulsions of water and decalin. Activity and selectivity across these systems will be compared.

Paper Abstracts

Name: Alex Moix
School: Arkansas, University of
Title: Carbon dioxide gas delivery to thin-film aqueous systems via hollow fiber membranes

Abstract:

Uneven distribution of energy throughout the world has caused political and economic tension, bringing renewable energy research to the forefront of scientific focus. The United States Department of Energy estimates that if biofuel produced from algae replaced all of the petroleum in the United States it would require only 0.42% of the country's total land area for production, 1/7 of the total land area used by corn crops in 2000 [1]. With promise for algae as a possible feedstock for renewable energy, this research focused on reducing the production cost and greenhouse gas emissions of algal production. Carbon dioxide addition to algal growth systems has shown to increase biomass production with the possibility of using industrial flue gas to reduce carbon dioxide emission to the atmosphere. This research used hollow fiber membranes as a carbon dioxide delivery mechanism into thin-film aqueous systems as an experimental representation of their performance in open algae growth systems such as algae raceways. Comparison with other gas delivery mechanisms, such as bubbling via a diffuser and open tube, shows hollow fiber membranes are far superior in terms of mass transfer efficiency. In under 25 minutes at a liquid depth of about 4 centimeters, the hollow fiber membranes delivered 60 times more carbon dioxide to the system than an open tube as well as 6 times more than a porous diffuser. This research has revealed that a large surface area, small pore size, and certain surface properties are key factors to hollow fiber superiority in carbon dioxide delivery into thin-film aqueous systems.

Paper Abstracts

Name: Alexander Long
School: Oklahoma, University of
Title: Transalkylation and hydrodeoxygenation of anisole over bimetallic Pt-Sn/SiO2 catalyst

Abstract:

In recent years, biomass-derived fuels have seen increasing interest as sources of alternative energy. Much of the world's energy is supplied by non-renewable and dirty sources such as coal and petroleum. Lignocellulosic biomass provides a renewable carbon source that has the potential to be CO2–neutral as the CO2 can be reabsorbed by algae and green plants for use in photosynthesis. The bio-oils produced from biomass have high oxygen contents and are not suited for use as transportation fuel. Thus it is important to upgrade these oils into a useable form. Our group focuses on this process of upgrading bio-oils to chemicals suitable for use a fuel.

One proposed upgrading method is catalytic hydrodeoxygenation. Anisole (methoxybenzene) has a methoxy functionality and is a model compound of some bio-oil components. The conversion of anisole over catalysts including supported metal catalysts and zeolites has previously been investigated by our group. Bimetallic catalysts are more recent discoveries and have shown promise. We propose that supported Pt-Sn catalysts can be used to catalyze the transalkylation and hydrodeoxygenation of anisole to toluene. The Pt hydrogenates the molecule while the Sn provides Lewis acidity and oxophylic sites.

This paper investigates the viability of SiO2-supported 1 wt.% Pt catalysts with varying molar ratios of Sn prepared via incipient wetness coimpregnation. Reactions are carried out in the vapor phase over solid catalyst in a tubular packed-bed reactor system. Catalysts with Pt:Sn ratios from 1:1 to 5:1 are currently under investigation. Good activity is observed at smaller amounts of Sn (larger ratios), but current data suggests that larger amounts of Sn (lower ratios) significantly reduce the activity of the catalyst.

Paper Abstracts

Name: Andrew Lambeth
School: Oklahoma, University of
Title: New Technologies to Enhance the Distillation Yield of Petroleum Fractionation

Abstract:

In this article, we review the performance of different technologies published in a recent patent by Ji and Bagajewicz aimed at increasing distillates yield. We also present different implementation schemes composed of various combinations of the two technologies and compare both distillate yield and energy expenditure to the current conventional distillation process for light, intermediate, and heavy crudes. We demonstrate sizable increases of yield as well as significant profit. The criteria for analysis were: yield, energy savings, gross margin, potential extra profit, and return on investment for each scheme. While the comparisons are made on the basis of grassroots design, we took one technology and we assumed a retrofit of an existing column via simple change in the heat recovery, to assess the extra investment needed.

Paper Abstracts

Name: Brian Li
School: Oklahoma, University of
Title: Characterization of Water-Oil Pickering Emulsions Stabilized by Carbon Nanotubes

Abstract:

Pickering emulsions are emulsions stabilized by solid particles that adsorb to the interface between the two phases in an emulsion. These stabilizing particles have potential applications as catalyst supports across phases in interfacial reactions. This research focuses on the characterization of water-oil emulsions stabilized by multiwall carbon nanotubes (CNTs). Specifically, the ability of various concentrations of pristine CNTs and oxidized CNTs to stabilize and adsorb to the interface of paraffin wax-water and dodecane-water emulsions were examined. Results from the study of the paraffin wax-water system indicate that both pristine and oxidized CNTs are able to successfully stabilize a paraffin wax in water emulsion by adsorbing at the interface between the oil and water phases. Additionally, oxidized CNTs produced more stable emulsions with smaller droplet sizes, suggesting that the contact angle of the CNTs due to oxidation can influence emulsion stability. Results from dodecane-water system demonstrate that emulsion droplet size changes with different degrees of CNT oxidation and CNT concentrations. As the concentration of CNTs increases, emulsion droplet size decreases. The interfacial area of the emulsion increases with CNT concentration, but begins to plateau past 0.3 wt% with respect to water. Additionally, at lower degrees of CNT oxidation, the emulsion forms a water in oil system, while inversion of the emulsion to an oil in water system is observed at higher degrees of CNT oxidation.

Paper Abstracts

Name: Carol Abraham
School: Oklahoma State University
Title: Dual Release of Doxycycline to Promote Tissue Regeneration

Abstract:

In tissue regeneration, cells are cultured on various biomaterials that are used as scaffolds. Naturally derived polymers such as gelatin (denatured collagen) have seen significant interest due to their ability to influence cellular functions and biocompatibility. However, when cells are cultured on gelatin, they secrete increased amounts of matrix degrading proteases, particularly MMP-2/9. An overexpression of MMP-2/9 will result in premature degradation of the matrix prior to regeneration. To prevent this, our approach is to use doxycycline (DOX), a member of tetracycline family of drugs known for antibiotic properties. Independent of antibacterial activity, it has been tested in numerous conditions associated with elevated matrix degrading enzymes, including arthritis and chronic wounds management. Since serum half-life of DOX is 18–22 hr, we approached nanoparticle (NPs) and matrix-based delivery. The DOX-loaded NPs in an injectable hydrogel will be useful in tissue regeneration of appropriate shape. First two biodegradable polymers were evaluated: synthetic poly (lactic-co-glycolic acid) (PLGA) and naturally-derived chitosan. The NPs were characterized using light scattering technique and the average diameter ranged from 200 to 500 nm. Ease of synthesis and uniform distribution of particle sizes when observed under a scanning electron microscope helped us select PLGA NPs for further use. DOX was dispersed inside chitosan-gelatin hydrogel. Evaluation of release kinetics showed that DOX PLGA NPs displayed a short term release while DOX PLGA NPs in hydrogel exhibited a sustained, long-term delivery. DOX PLGA NPs in hydrogel were then placed in different solutions of cell culture, with the results being analyzed for MMP-2/9 levels, gel strength/stability, and cell proliferation. Cell cultures showed no toxicity from DOX at the proposed concentration. We hope to directly correlate cause and effect of DOX release to MMP-2/9 secretion levels and improvement in regenerated tissue quality.

Paper Abstracts

Name: Catherine R. Suchanek
School: Iowa, University of
Title: Initial Velocity Studies Comparing Heavy and Light Thymidylate Synthase

Abstract:

Thymidylate Synthase (TSase) catalyzes the last committed step in thymine biosynthesis, i.e., the conversion of deoxyuridine monophosphate (dUMP) to thymidine monophosphate (dTMP), an essential process in regulating the abundance of DNA precursors in vivo. Enzyme defects can cause abnormalities in this regulation and has been linked to human cancers. This makes TSase a target for chemotherapeutic drugs.

Recent studies investigated the involvement of protein vibrational motions aiding chemical reactions. Studies isolating effects of the heavy enzyme on kinetic steps in the catalyzed reaction are conducted by comparing light (natural distribution of isotopes) and heavy (13C, 15N, 2H labeled) TSase. Initial velocity studies of the heavy and the light TSase were conducted to establish, and compare, the temperature dependence of Kcat and the associated activation parameters. Additionally, kinetic isotope effects (KIEs) were measured on V/K rate constant and the three H-isotopes used to extract the intrinsic KIEs on the chemical step.

Initial velocity data were analyzed to obtain the kcat value for each enzyme at four temperatures (5°C, 25°C, 30°C, 40°C). Rates for both light and Heavy TSases were found experimentally by measuring initial velocities at different dUMP concentration as function of 5,10-methylenetetrahydrafolate concentration and vise versa. Rates were fit to the Michaelis-Menten equation, with or without substrate inhibition, as 5,10-methylenetetrahydrafolate showed substrate inhibition. Parameters KM and Kcat were compared for both heavy and light TSases at all temperatures and were identical (within the experimental error). These findings demonstrate that altering the protein mass does not affect the Kcat or KM. Since kcat is rate limited by product release, it is apparent this component has not been affected by the altered mass and fast vibrations of the protein. Future work will include repeated analysis and further study of the kinetic isotope effects, which are expected to report on effects of much faster vibrations.

Paper Abstracts

Name: David Francis
School: Nebraska, University of
Title: Engineering of liposomal nanoparticles as platforms for delivery of nucleic acids to treat cardiovascular diseases

Abstract:

Cardiovascular disease (CVD) is the most serious health problem in the United States affecting over 84 million Americans. Diabetes has been shown to greatly enhance the risk and severity of CVD due to coinciding risk factors coupled with increasing diagnostic prevalence. Gene delivery/gene therapy is an innovative treatment option for cardiovascular disease that provides long-term disease management. Drug delivery through nanocarriers is becoming more popular due to their ability to efficiently transport drug to specific tissues and bypassing undesirable medical procedures. Typically, chemical and physical techniques (e.g., lipofection or electroporation) are used for in vitro delivery of nucleic acids, but targeted delivery of active nucleic acids in vivo remains a significant challenge. Engineering of new delivery systems for in vivo applications are the focus of intense investigation by industrial and academic researchers. In this project, we propose using a highly customizable liposome based drug delivery vehicle for targeted nucleic acid delivery to treat diabetic induced CVDs. We have engineered and optimized liposomes of various size, surface charge, amount of polymer coating, and optimal drug encapsulation. Particle size distribution, mean diameter, and zeta potential of liposome nanoparticles were measured using a NanoBrook ZetaPALS zeta potential and dynamic light scattering instrument. The particle size distribution and mean hydrodynamic diameter was analyzed as volume averaged distributions using a scattering angle of 90°. The Smoluchowki model was utilized to calculate the zeta potential from mobility measurements. All measurements were performed in 0.05x PBS (pH 7.4) at room temperature. Our preliminary cell uptake studies indicate that FITC-labeled dextran was taken up by cells providing confidence that this effect may be extended to other nucleic acid molecules. HL-1 cardiac cells exposed to elevated glucose levels are currently used as an in vitro model system for diabetes mediated CVDs. A comparative study is underway to determine the delivery efficiency of the nucleic acid molecules using liposome nanoparticles to these cells. We are investigating the cell response using optical microscopy and PCR/western blotting. Our final goal is to deliver the exemplary amount of drug to cells to reverse the diabetic expression back to homeostatic expression.

Paper Abstracts

Name: German Parada
School: Iowa State University
Title: Bio-inspired synthesis of magnetite nanoparticles using bacterial protein Mms6

Abstract:

Several species of magnetotactic bacteria are able to synthesize uniform single-crystal magnetite nanoparticles that work as magnets to align themselves with Earth's magnetic field. Based on previous work, which identified key proteins involved in this process, our group has developed novel methods for the synthesis of magnetic nanoparticles in vitro at ambient and aqueous conditions. Research has focused on recombinant protein Mms6 and its mutants, and this protein was initially utilized in the creation of magnetite nanoparticles in bulk solution via chemical co-precipitation, method that yielded highly magnetic monodisperse particles. After that, different metal ions were incorporated in the synthesis to obtain nanoparticles of interesting chemical compositions not found in nature with improved magnetic properties. Also, work was done to immobilize the protein on a flat surface and particles were synthesized on the surface. The hydrophobicity of the surface was modified to simulate the natural environment of the protein, and particle patterns were made by using soft lithography methods. Current research involves the development of a DNA-protein conjugate zipper to detach the particles from the surface in a controlled and reversible manner.

Paper Abstracts

Name: Hailey Dunsworth
School: Arkansas, University of
Title: Reverse Electrodialysis: Sustainable Energy from Hydraulic Fracturing Water Recycle

Abstract:

Due to the growing limitations in dependence on fossil fuels, attention has been turned towards searching for alternative means for harvesting energy. One emerging source is energy produced from natural salinity-gradients between freshwater and seawater. Two different processes used to accomplish this are pressure-retarded osmosis and reverse electrodialysis. Significant amounts of research are currently under way regarding pressure-retarded osmosis, however very few studies have been conducted on reverse electrodialysis due to heavy resistance in the diluate chamber of a reverse electrodialysis cell. The focus of this research is to reduce this resistance by using wafers and ion-exchange beads in order to maximize net power gain. Surrogate brackish/saltwater feed streams were used to measure overall power density.

By reducing resistance to levels previously deemed impossible, we are exploring the fundamental limits of separation technology. This research proposes an innovative resolution to high resistance levels through the use of ion exchange wafers to promote ionic movement. Here we show that such wafers have a great impact on the reverse electrodialysis process, and succeeded in achieving a sizeable gain in power density.

Traditional applications include harnessing energy from areas where freshwater bodies meet saltwater, as in an estuary. The future of reverse electrodialysis, however, lies in fracking. Produced water from a fracking well site in Oklahoma was used for power density calculations under realistic conditions. Preliminary results show that our system is capable of producing power densities of up to 10W/m2, which are five times higher than the current state-of-the-art. Environmental concerns will be all but eliminated if fracking can evolve to be a sort of cyclic process, where brackish fracking water is converted to energy to, in turn, power the overall operation. This poster presentation will model the power increase of electrode ionization and comment on future potential for improvement, especially in the realm of hydraulic fracturing applications.

Paper Abstracts

Name: Haley Cleous
School: Arkansas, University of
Title: Recycling Wastewater for Hydraulic Fracturing
Abstract:

Hydraulic fracturing is the use of water to recover natural gas and oil. This process uses up to 15 million gallons of water per well and is unsustainable. The treatment and recycle of hydraulic fracking water is an engineering best practice not only from an environmental standpoint, but also from an economic standpoint. The current disposal method of deep well injection is a costly and ineffective solution. If frac water is treated and recycled, the savings in water and disposal fees would not only pay for the water treatment program, but also give a return on investment of approximately 30%.

Wastewater treatment options may range from traditional chemical precipitation to evaporation to membrane systems such as Nano filtration, a VSEP system, ultrafiltration, or reverse osmosis. Depending on purity requirements, water treatment methods may be placed in parallel or used independently.

Paper Abstracts

Name: Jacob Young
School: Iowa, University of
Title: Flammable Parameters: A Comparison of Experimental to Theoretical Values

Abstract:

This research involved collecting a variety of flammability data of flammable mixtures. The flammable parameters included lower and upper flammability limits (LFL & UFL), flash points (FP), and minimum ignition energies (MIE). These parameters were determined using a flash point tester and two pieces of equipment that were custom made by Fauske and Associates: a flammability chamber and an MIE apparatus. The experimental FPs of flammable liquid mixtures were compared to values calculated assuming ideal and non-ideal (i.e., real) mixtures. The experimental LFLs & UFLs of methane/propane mixtures were compared to the estimates calculated using the standard LFLmix and UFLmix equations. Furthermore, a modified flammability diagram was developed to display the flammability zone of the methane/propane mixture. MIEs of methane/propane mixtures are being determined and the resulting data will be used to develop mixture rules. This overall research project will fill a void since the existing literature contains minimal data for flammable mixtures, i.e., most existing data are limited to pure substances. The long term goal of this research is to develop reliable methods to predict these important parameters for mixtures of flammable materials in order to improve safety for the use of flammable mixtures used in industry and in laboratories.

Paper Abstracts

Name: John Dominick
School: Arkansas, University of
Title: Configuration and Development of TSI Powersight Solid State Laser-based LDV System

Abstract:

The study of dense gas dispersion at atmospheric conditions is critical to maintain and enhance the safety of industrial operations where large amounts of toxic gases are stored and generated. A large release of these gases into the atmosphere could have catastrophic effects. The Chemical Hazards Research Center (CHRC) at the University of Arkansas performs important research on dense gas dispersion. The CHRC houses the world's largest slow speed wind tunnel to simulate gas dispersion at atmospheric conditions. Substantial amounts of data, including velocities, are recorded for modeling real life gas dispersion events. Before conducting experiments, an accurate characterization of air flow within the wind tunnel, especially at the lower boundary layer, must be established. The goal of this project was to install TSI's Powersight Solid State Laser-based LDV System and use the system to characterize the velocity profile of the wind tunnel. Hotwire anemometry velocity measurements were also taken and used to determine the accuracy of the LDV system's velocity data. The major steps of the project included the physical installation of the LDV system, alignment of the laser probes within the tunnel, initial LDV velocity measurements, hotwire anemometry measurements, and finally any adjustments needed to properly calibrate the LDV system. Once the LDV's measurements were established as accurate, the data was collected to form the characterization of air flow through the wind tunnel.

Paper Abstracts

Name: Kaylee Smith
School: Arkansas, University of
Title: Targeted Drug Delivery using Peptoid- Based Nanospheres

Abstract:

While medicine has improved greatly in the last couple of decades, there are negative side effects that accompany many drugs. Undesirable side effects could be greatly reduced if non-systemic drug delivery systems were used because the medicine would harm diseased cells at a much higher rate than it does healthy cells. One possible non-systemic drug delivery system is peptoid nanospheres. These nanospheres will then be linked to another peptoid that is engineered to attach almost exclusively to diseased cells. This research project is focused on designing peptoids that will form nanospheres in solution. Four specific peptoids were synthesized and tested because they had been previously shown to form nanospheres of the appropriate size. These peptoids were synthesized then purified using high pressure liquid chromatography. After purification was complete, circular dichroism was used to determine the relative helicity of the peptoids. Then the peptoids were dried on silicon chips and scanning electron microscopy was used to test for nanosphere formation. Next dynamic light scattering was used to determine if the peptoids formed structures in a 4 to 1 methanol and water solution. Circular dichroism showed that all the peptoids were helicial while scanning electron microscopy showed that one of the four peptoids formed nanospheres. This indicates that helicity is not the main factor in nanospheres formation. Dynamic light scattering showed that one of the peptoids does form structures in solution. The other three peptoids have not yet been tested using dynamic light scattering. The next step is to analyze the solutions using a transmission electron microscope to determine if the structures formed are spherical. Once the testing of these four peptoids is complete, other peptoids will be designed to form spheres of the proper size. When designing these peptoids, biocompatibility and cell specificity will be considered. The new peptoids will then be synthesized and tested in the same manner as the four original peptoids.

Paper Abstracts

Name: Lauren Rogers
School: Arkansas, University of
Title: Modulating Amyloid Beta Aggregates with Peptoids

Abstract:

The goal of this project is to design and understand how a non-natural protein would work for the treatment of Alzheimer's disease. This follows up with one of the theories behind Alzheimer's disease; that is the build-up of the protein amyloid beta causes plaques to form on nerve cells, resulting in the death of these nerve cells. Severe memory loss and death are two consequences of the death of these cells. Currently, there is no cure for the disease, nor any way to reverse the symptoms; there is only medication that may slow down the disease. However, recent research with peptides, a small scale protein, shows progress towards reducing the plaque build-up and reversing the aggregation, mis-folding, of the protein. Unfortunately, the body naturally breaks down these peptides before they are able to take full effect. Use of a non-natural protein or peptoid is not easily degraded by the body, which makes them a better option. In previous research, peptoids have proven to be able to modulate the formation of amyloid beta. As of now, research is being done to see how well peptoids can modulate amyloid beta aggregates overtime.

Paper Abstracts

Name: Robert Tempel
School: Iowa, University of
Title: Quantifying the Effect of Fumed Silica on Formulation Viscosity

Abstract:

In small amounts, fumed silica can drastically increase the viscosity of liquids without significantly altering the chemical composition. A Brookfield viscometer was used to quantify viscosities of methacrylate monomer formulations containing up to 4wt% fumed silica for 0.007 and 0.2 μm particles, as well as mixtures of the two. Calibration curves were developed for the three cases. Using these curves, the needed concentration and particle size of fumed silica can be selected to obtain specific formulation viscosities. This work is part of a larger study to determine the interplay between viscosity and oxygen diffusion in formulations undergoing radiation cure.

Paper Abstracts

Name: Supriya Thote
School: Arkansas, University of
Title: Production of biodiesel from free fatty acids and triglycerides by reaction with high temperature methanol

Abstract:

Natural oils like vegetable oil, algae oil and tall oil can be used as feedstock for the production of biodiesel. The free fatty acids (FFAs) present in natural oils react with methanol by esterification whereas the fatty acids present in triglycerides (TGs) react by transesterification to produce fatty acid methyl esters (FAMEs), the main component of biodiesel and glycerol, a byproduct that is commonly used in the production of soap. Traditional methods of production - acid-catalyzed and base-catalyzed processes - have limitations. An acid neutralization step is required in this acid-catalyzed process and alkali-catalyzed processes have high sensitivity to the presence of water. This research focuses on a new catalyst-free process for making biodiesel - the reaction of soybean oil with methanol at high temperature in the presence of water. Although soybean oil is composed mostly of triglycerides (TGs), these can be converted into free fatty acids (FFAs) through hydrolysis and then further converted to FAMEs by reaction with methanol. Experimental results showed that the quantity of FAMEs produced by transesterification during this process is negligible. It was concluded that the hydrolysis of triglycerides to produce FFAs was followed by esterification of FFAs into FAMEs. The effects of temperature, water content, residence times and methanol to oil molecular ratio were also observed. Experimental results showed that the presence of small amounts water did result in a better conversion of TGs to FAMEs, whereas excess water seemed to inhibit the esterification reaction. This study hence establishes that hydrolysis and esterification can be carried out in the same reactor and while shedding light on the relationship of temperature and water to methanol ratio with the conversion of TGs present in soybean oil to FAMEs.

Paper Abstracts

Name: Valerie Reyes Loayza
School: Arkansas, University of
Title: Use of Peptoids Microspheres to improve Enzyme Linked Immunosorbent Assay (ELISA) Microarrays.

Abstract:

The pursuit of an efficient and economical technique for early detection of cancer has led to the development of sophisticated biosensors for antigen analysis. As biosensors become more complex, coatings are necessary and important. The preferred coatings need to have the following properties: high surface area for binding, resistance to biofouling, and flexible synthesis. This project will focus on determining whether using peptoid microsphere-coated glass slides in the Enzyme Linked Immunosorbent Assay (ELISA) Microarray is a better technique than using regular commercially available glass slides. Current microarray slides are coated with reactive groups, such as amines, epoxides, or aldehydes. It is believed that using three-dimensional coatings will allow for increased binding efficiency of the capture reagent, and therefore increased dynamic range and sensitivity. Helical peptoids that are partially soluble in water have been shown to form microspheres when dried on a solid surface. In this project, peptoids will be synthetized, purified and characterized. Each peptoid will be dissolved in a protic solvent to stabilize the secondary helical structure and promote microsphere formation. The peptoids solutions will be administered onto the ELISA microarrays glass slides and allowed to dry in order to form uniform microsphere coatings. The peptoid microsphere-coated glass slides will be tested and compared against commercially available glass slides for use in ELISA microarray.

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Barr Engineering

Barr Engineering Co. is an employee-owned consulting company integrating engineering and environmental expertise to help clients develop, manage, process, and restore natural resources. We serve the power, mining, and fuels industries, natural-resource-management organizations, and others with complex problems. Our clients' projects take us across the Americas and around the world.

Barr Engineering Co.'s staff of more than 700 provides engineering and environmental services to clients in the power, manufacturing, mining, and fuels industries, to natural-resource management organizations, and to others with complex problems. Our areas of expertise include air quality permitting, environmental management and compliance assistance, water resources management, contaminated-site assessment and remediation, engineering and design of facilities and systems, and materials handling design. Incorporated as an employee-owned firm in 1966, Barr has offices in Minneapolis, Duluth, and Hibbing, Minnesota; Jefferson City, Missouri; Ann Arbor, Michigan; Bismarck, North Dakota; and Calgary, Alberta.

Dupont

For more than 200 years, DuPont has brought world-class science and engineering to the global marketplace through innovative products, materials and services. Our market-driven innovation introduces thousands of new products and patent applications every year, serving markets as diverse as agriculture, nutrition, electronics and communications, safety and protection, home and construction, transportation and apparel.

Today, DuPont is proud to build on this heritage by partnering with others to tackle the unprecedented challenges in food, energy and protection now facing our world. With global population expected to approach nine billion by 2050, DuPont is working with customers, governments, NGOs and thought leaders to discover solutions to today's toughest challenges.

Penford

Penford is a recognized leader in modified specialty starches. We help our customers by developing customized specialty starches with superior performance, yield and cost advantages. How? Unlike our competitors, we recognize that each customer is unique. So we develop solutions specifically based on their business model, market opportunities and capabilities – to help them win in the marketplace. Then we support those solutions with reliability, responsiveness and superior service.

Integrated DNA Technologies

Integrated DNA Technologies (IDT) is a leader in manufacturing and developing products for the research and diagnostics life science market. IDT serves the areas of academic research, biotechnology, and pharmaceutical development. IDT was founded by Dr Joseph Walder in 1987. Since then, its development has been guided by an uncompromising approach to quality, a belief in the value of good service, and a determination to minimize consumer costs. Serving over 80,000 life sciences researchers, IDT is widely recognized as the industry leader in custom oligonucleotides due to its capabilities in analytical sophistication, design engineering, customer support, reagent and input control.

Monsanto

Monsanto is a sustainable agriculture company that delivers agricultural products that support farmers all around the world. The Muscatine Plant produces products in two families of chemistry. These include Glyphosate Products and Selective Chemistry Products. The site provides over 70% of Monsanto's US Glyphosate Market and 100% of Monsanto's US Acetanilide Market from this location.

International Paper

International Paper (NYSE: IP) is a global leader in packaging, paper and fluff pulp with manufacturing operations in North America, Europe, Latin America, Russia, Asia and North Africa. Our businesses include industrial and consumer packaging, fluff pulp and uncoated papers, complemented by xpedx, the company's North American distribution company.

Headquartered in Memphis, Tenn., the company employs approximately 70,000 people worldwide and is strategically located in more than 24 countries serving customers around the globe. International Paper net sales for 2012 were $28 billion.

International Paper's vision is to be one of the best and most respected companies in the world. A company of substance in everything we do, from the products we make, to investing in communities, to protecting our environment, International Paper supports communities where our employees live and work. Through the International Paper Foundation and regional foundations established in Poland and Brazil, International Paper conducts philanthropic activities that provide charitable funds annually around the globe. Through the Foundation, International Paper employees work to give their money and time to make people's lives and the communities where International Paper operates even better.

Executive Student Committee

The Executive Student Committee (ESC) is composed of students, who are regional liaisons and work with presidents in their region. The goal of the regional liaison position is to be a resource to presidents that can allow them to improve their chapters. Regional liaisons try to have monthly calls with up to 8 presidents assigned to them. The regional liaisons also work to help improve the region by leading presidents meetings at conferences and over the phone. The ESC is working to grow and improve the magnitude of support it gives presidents. We elect new regional liaison at every regional conference and elect cabinet members at the national conference. If you are interested, contact the chair or one of your regional liaisons.

Chair:

Michael Briggs chairman.esc@gmail.com

Vice Chair :

Kayla Al-Khaledy vchair.esc@gmail.com

Mid America Regional Liaisons:

Sebastian Bohn sebastianbohn-91@hotmail.com

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