



**2009**

**Michigan Green Chemistry  
Governor's Award Nominations**

**BUSINESS CATEGORY**

## 2009 Michigan Green Chemistry Governor's Award Nomination

### Amway

### *Legacy of Clean Dishwasher Detergent*

Amway Legacy of Clean™ Dishwasher Detergent powder is a phosphate free automatic dish detergent that outperforms phosphate containing dishwashing products. Phosphate is a key component of the top performing auto dish products. Its key contribution is chelation of hard water minerals which contribute to poor spotting and filming on glassware. Linked to eutrophication of lakes and streams, the use of phosphate cleaning products has been banned in many areas.

The patent pending phosphate free formula of Legacy of Clean Dishwasher Detergent provides superior spotting and filming performance and reduced etching over leading brand phosphate auto dish formulas.

The formula development was initiated in September 2006, in the Amway Research and Development Laboratories, Ada, Michigan.



## 2009 Michigan Green Chemistry Governor's Award Nomination

### PPG Industries

#### *Chitosan Enhanced Paint Detackifier GREEN LOGIC™*

GREEN LOGIC™ is a liquid, chitosan-containing, paint denaturant technology that provides an alternative to traditional melamine-formaldehyde (a suspect carcinogen) or acrylic acid based chemistries. The unique feature of the GREEN LOGIC™ technology is that it is derived from crab, lobster and shrimp shells that are a waste product of food production. The GREEN LOGIC™ technology has performed as well as and better in some cases than traditional products used in this area while providing significant cost savings and carbon footprint reduction advantages to customers.

All research, development, education, advocacy, and implementation (including sales and marketing) of the GREEN LOGIC™ technology is through PPG Industries, Troy, Michigan.

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## 2009 Michigan Green Chemistry Governor's Award Nomination

### Dow Corning Corporation

#### *A Program and Tool to Eliminate Hazardous Chemicals from Product Portfolio*

With sustainability as a core value, Dow Corning established corporate goals that focus on applying green chemistry principles to new technology development and improving the green chemistry profile of certain existing products through the creation of an environmental compatibility program.

By taking a green approach for new development, scientists were directed to employ an eco innovative or life cycle approach in the development of new products & processes using green chemistry and engineering principles. In addition, looking at green redesign of existing products allowed Dow Corning an opportunity to proactively reformulate a number of products to contain more green ingredients.

As a result of these initiatives at least 530 metric tons of chemicals considered high priority by Dow Corning have not entered commerce.



## 2009 Michigan Green Chemistry Governor's Award Nomination

### Bissell Homecare, Inc.

#### *Bissell Sustainable Consumer Cleaning Products*

In 2007, Bissell made the decision to partner with the United States Environmental Protection Agency (US EPA) in their "Design for the Environment" (DfE) Program. At the time of nomination Bissell had reformulated 30 of its top cleaning products, now accepted and recognized by the US EPA DfE Program. These new cleaner chemistries have solved the problems of excess VOC's, undesirable human toxicity, and/or poor environmental fate. These reformulated chemical products represent over 96% of the volume of chemistry manufactured and marketed by Bissell. They created over 70,000,000 pounds of highly effective, yet extremely low toxicity, readily biodegradable cleaners, to be used by consumer households worldwide.

This sustainable chemistry effort has allowed Bissell to retain and expand its number of Research and Development and Manufacturing associates, as well as to invest millions of dollars in expanded research and development and chemical manufacturing operations in Grand Rapids, Michigan.



## 2009 Michigan Green Chemistry Governor's Award Nomination

### Biosolutions LLC

#### *Clean & Green Cleaning Products*

Biosolutions LLC, Clean & Green™ technology is based on the non-ionic alkyl alcohol ethoxylate surfactants rather than commonly used nonylphenol or alkylphenol ethoxylate surfactants. The Clean & Green™ Cleaning Products are environmentally preferable products; they are less toxic to humans than many products currently in use, inherently safer with regard to accident potential, and are biodegradable.

Clean & Green™ products are recognized under the United States Environmental Protection Agency's Design for the Environment Formulator Program. Clean & Green™ Cleaning Products meet or exceed Performance Testing under Design for the Environment's Formulator Program for general purpose cleaners and glass cleaners.

Research, development, and manufacturing for the product line all occurred in Michigan. More than 85% of sales and use of our products occur in Michigan, which then positively impacts the environment and health profiles in Michigan.



## 2009 Michigan Green Chemistry Governor's Award Nomination

### ELCAL Research LLC

### *Green Thermal Energy Storage System for Residences and Commercial Buildings*

The Active Thermal Energy Storage System provides space and water heating for household and business dwellings. The system stores intermittent heat energy from off-peak conventional electric power generation, solar panels, wind power generation and other intermittent/renewable sources, then actively delivers the stored energy where and when needed. It does not burn or require any fossil fuels. The key to this system is a clathrate material having a melting point of 25 °C (77 °F) with a heat of fusion of approximately 60 cal/g (108 BTU/lb).

This innovative heat energy storage system, which has a long-term service life, is an environmentally friendly device that can nearly eliminate CO<sub>2</sub> emissions from residences and buildings that use it.

All research design, testing, and development have been and continue to be conducted in Michigan. A test site (demonstration facility) has also been constructed within Michigan.

## 2009 Michigan Green Chemistry Governor's Award Nomination

### Herman Miller

#### *Herman Miller Converts Popular Task Chair to Non-Halogenated, non-PBDE Flame Retardants*

Herman Miller is actively working to implement green chemistry into our products and processes. A recent challenge for Herman Miller was to create a highly visible polypropylene injection molded component using a non-halogenated flame retardant (FR). After working with Clariant and Cascade Engineering, Herman Miller developed a solution and successfully commercialized a non-halogenated FR for the Mirra chair. CESA-flam CT-1629NH from Clariant replaced the existing PBDE FR. This change not only reduces the environmental footprint of the products this FR goes into, but it also simplifies the plastic injection molding process of Herman Miller's chair by reducing both tool cleaning and the number of additives.

Herman Miller is leading the development of safer FR chemicals in the contract furniture industry. The use of green chemistry allows Herman Miller to stay ahead of the regulatory curve and to meet the growing demand for safer products.



## 2009 Michigan Green Chemistry Governor's Award Nomination

### Amway

#### *Legacy of Clean SA8<sup>®</sup> BioQuest<sup>®</sup> Laundry Detergent*

SA8<sup>®</sup> BioQuest<sup>®</sup> is a super concentrated phosphate free laundry powder detergent that combines readily biodegradable surfactants with a readily biodegradable water softener based on renewable sources. It is produced using a low energy process relative to standard laundry powders. The resultant detergent requires a lower dose than leading powders thus reducing the amount of chemicals going down the drain as well as reducing the packaging required for an equivalent number of uses.

SA8<sup>®</sup> BioQuest<sup>®</sup> was recognized December 12, 2008, for safer chemistry by the United States Environmental Protection Agency under its Design for the Environment Formulator Program. It has been reformulated with a higher concentration protease and amylase that provide specially focused cold water stain fighting.

Formulated and developed in the Amway R&D Laboratories in Ada, Michigan, SA8<sup>®</sup> BioQuest<sup>®</sup> is produced, packed and shipped globally from Amway's Ada factory.



## 2009 Michigan Green Chemistry Governor's Award Nomination

### SAE International

#### *SAE International Technical Standards and Cooperative Research Efforts in the Alternative Refrigerants Area*

The Cooperative Research Program of SAE International serves to bring more minds to the challenges and issues we face as an industry. Driven by the European Union's F-Gas Directive to phase out the automotive refrigerant HFC-134a, a Cooperative Research Program was administered by SAE and sponsored by the 45 partnering organizations to evaluate alternative refrigerants for use in mobile air conditioning systems. The participants have worked over 5 years to identify and compare alternative refrigerants and then evaluate them to assess toxicology, system performance, chemical compatibility and material compatibility.

SAE standards have been produced by SAE's Technical Standards Committees as a result of the findings of the research program and in response to mitigating emissions of the existing refrigerant while the evaluation for alternatives continues.

SAE's Standards program is managed and directed from SAE's Automotive Headquarters in Troy, Michigan.



## 2009 Michigan Green Chemistry Governor's Award Nomination

### Dow AgroSciences

#### *Spinetoram: Enhancing a Natural Product for Insect Control*

Spinetoram is the active ingredient in a series of insecticides formulated by Dow AgroSciences, a subsidiary of The Dow Chemical Company. Spinetoram is a mixture of chemically modified spinosyns J and L. Spinetoram (XDE-175) results from a goal to create a new spinosyn insecticide that is more effective than spinosad but maintains spinosad's low toxicity to mammals and other non-target organisms, short environmental persistence, and minimal effects on beneficial arthropods.

Because of its high level of efficacy against insect pests, low toxicity, and low environmental impact, spinetoram has direct benefits for Michigan farmers. Spinetoram products (Delegate™ WG and Radiant™ SC) are registered for use to control many important insect pests on a wide range of crops, including apples, blueberries, grapes, peaches, strawberries, cherries, asparagus, beans, carrots, celery, sweet corn, cucumbers, onions, peppers, potatoes, squash, and tomatoes.

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## 2009 Michigan Green Chemistry Governor's Award Nomination

### American Seating

#### *A Convert to Greener Conversion Coating*

On September 27, 2008, American Seating went live and into full production with the use of a new (for the furniture industry) metal pre-treatment process. This process incorporates the use of a Zirconium conversion coating technology as the base coating preparation, prior to final powder coat painting on metal components.

This process reduces the amount of water discharged and the amount of potential pollutants in that waste water, thus producing a much cleaner chemical manufacturing process. It does this economically and utilizes virtually the same equipment, with a few parameter adjustments, as the old process. It does realize an improvement in energy efficiency, as the treatment chemicals and rinses no longer must be heated above ambient temperatures. And, because it no longer uses phosphate chemicals, this potentially harmful nutrient is no longer being released into rivers, lakes and waterways. This makes it safer for the environment.

All of the development and implementation for this conversion was done in Michigan for use in American Seating's Michigan facilities.



## 2009 Michigan Green Chemistry Governor's Award Nomination

### UtilX Corporation

#### *Dimethyl Dibutoxy Silane a Green Fluid for Underground Restoration of Medium Voltage Electrical Cables*

Dimethyl Dibutoxy Silane (DMDB) has been found to be an excellent fluid for the restoration of damaged underground electrical cables. Older cables directly buried in the ground are experiencing increasing levels of ground water due to diffusion of the water through the cable insulation. If the cable is not too far gone the DMDB fluid can be injected into the cable from the terminations in switch gear or at transformers. The injected cable now has had its life extended by more than 20 years.

All alkoxysilanes produce an alcohol during their hydrolysis reaction. This new generation fluid improves upon its predecessors by creating the environmentally benign butanol in very trace amounts as opposed to the methanol created by the earlier generation products.

To date over 1.75 million feet of cable have been treated with this new fluid manufactured in Michigan at Dow Corning Corporation.



## 2009 Michigan Green Chemistry Governor's Award Nomination

### Amway

### *eSpring Water Purifier System Redesign*

Amway redesigned a popular personal (in-home) water purification system that reduced the product's plastic content by 51%, its global warming potential by 46%, its energy use by 46%, and its hazardous chemical content over previous models. All this was accomplished without sacrificing the product's ability to deliver exceptionally clean, great tasting water.

As part of Amway's evolving life cycle management approach to total product performance, a formal Life Cycle Assessment (LCA) was conducted in 2009 to compare the newest model, the Calypso, with an older model, the Arata. The LCA documented the new model's solidly improved environmental performance and allowed Amway to build experience and capacity with using the life cycle management approach.

Lessons learned from both the process of the redesign and the LCA exercise were used to integrate sustainability design elements into Amway's product development strategies. Strategies that now include exploring new opportunities for using the environmental performance of products to drive business value through positive marketing and promotion initiatives.

## 2009 Michigan Green Chemistry Governor's Award Nomination

### Dow Corning Corporation

#### *Elimination of Solvent Based Separations Processing Enables Sustainable Growth for Silicone Products*

The unique physical properties of silicone rubber have never been in greater demand. As silicone product demand increased, Dow Corning initiated actions to expand internal manufacturing capacity for an intermediate filler treating agent. The treating agent functionally serves to prevent premature hardening of silicone materials, supporting subsequent silicone rubber fabrication.

The intermediate's previous manufacturing process utilized toluene as a process aid to facilitate a separations operation. The Midland, Michigan, based team identified a mechanical separation technology capable of replacing the current toluene enabled chemical separations process. A laboratory scale pilot process was established at Dow Corning's Midland Plant facility allowing the research team to validate the mechanical separation technology. After successful laboratory scale process validation, Dow Corning invested approximately \$1,000,000 to the Midland Plant manufacturing process, implementing the solventless separation method.



**2009**

**Michigan Green Chemistry  
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**ACADEMIC CATEGORY**

## 2009 Michigan Green Chemistry Governor's Award Nomination

### Yinlun Huang, PhD, Wayne State University *Integrated Hazardous Chemical-Metal Near-Zero Discharge Technology for Green and Profitable Design and Operation of Electroplating Processes*

Over the past decade, Huang has led his research group to conduct comprehensive studies on hazardous-substance-focused source reduction in the electroplating industry, with a promise of profit generation through technology implementation.

The Integrated Hazardous Chemical-Metal Near-Zero Discharge (CheMetNZD) Technology developed by Huang is an integration of two key technologies: (i) the hazardous chemical solvent/acid near-zero discharge technology through designing and operating a Stage-wised Chemical Allocation Network (SCAN), and (ii) the hazardous plating solution near-zero discharge technology through designing and operating a Reversed Electroplating Solution Recover System (RESORS).

The technology was successfully implemented in K.C. Jones Plating Company in 2007, with significant environmental and economic benefits.

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## 2009 Michigan Green Chemistry Governor's Award Nomination

### Patricia Heiden, PhD, Michigan Technological University *A Novel Approach to Prevent Biocide Leaching*

Polymer nanoparticles are synthesized along green chemistry principles, using biologically safe materials to contain wood preservatives (biocides) and release the preservative biocide in a slow, diffusion-controlled release. Containing the biocide within a solid phase nanoparticle allows biocides to be introduced into solid wood by water-based pressure treatment and provides a protected reservoir of biocide in the wood, allowing only small amounts to be released at any given time.

The key advantages of this approach are: one-pot, one-step nanoparticles prepared in water at high solid levels (10-15 wt% compared to ~0.5-2 wt% by other methods); nanoparticles are made and delivered using water; the polymers are environmentally benign; and the toxic biocide is less susceptible to leach, which protects sensitive environments. Also, because less biocide is leached, wood is able to be in service longer by protection with less biocide.

## 2009 Michigan Green Chemistry Governor's Award Nomination

### Phillip E. Savage, PhD, PE, University of Michigan *Terephthalic Acid Synthesis in High-Temperature Liquid Water at High Concentrations*

This technology replaces a flammable organic solvent with water. It also eliminates the production of methyl bromide pollution (about 25,000 lb/yr/plant) from terephthalic acid synthesis and the need to synthesize about 1 billion lb/yr of acetic acid as make up solvent.

Thus, the environmental impacts associated with methyl bromide emissions and the manufacture of this acetic acid can be avoided. The potential global impact of a water-based process for making terephthalic acid is enormous.

The investigators also developed and analyzed conceptual chemical process designs for this new reaction medium to show quantitatively that it is competitive on the bases of economics, energy consumption, and environmental impacts. The research also developed processing strategies so that high concentrations, such as those needed for a commercial process, could be used with these greener reaction conditions.

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## 2009 Michigan Green Chemistry Governor's Award Nomination

### Bart M. Bartlett, University of Michigan *Transition-Metal Oxide Thin-Films for Solar Energy Conversion*

The growing demand for energy worldwide has brought increasing attention to alternative fuels that are both clean and efficient. A highly sought avenue of renewable energy exploration is hydrogen production via the photocatalytic splitting of water. In this solar-to-chemical energy conversion, closed-shell metal oxide semiconductors have been the traditional focus of research, with early-metal containing  $\text{TiO}_2$  being the classic example. However,  $\text{TiO}_2$  is an ultraviolet light absorber, with a band gap energy of roughly 3 eV, poorly matched to the solar spectrum.

Our research focuses on preparing semiconducting metal oxides composed of late metals in order to decrease band gap. In moving from left to right across the transition series, the metal d orbitals shift to lower energy as electronegativity increases. We have demonstrated visible light absorption and photocurrent in thin films of  $\text{CaTi}_{1-x}\text{Ru}_x\text{O}_3$  and are exploring this chemistry using only first-row transition metals, replacing Ru with Mn and Fe.



**2009**

**Michigan Green Chemistry  
Governor's Award Nominations**

**EDUCATION CATEGORY**

## 2009 Michigan Green Chemistry Governor's Award Nomination

### Kettering University

#### *Incorporation of Green Principles into Organic Chemistry for Engineers*

Promoting environmentally responsible engineers and scientists necessitates the integration of green chemistry into the undergraduate engineering curriculum. In response to this need Kettering developed a pollution prevention, green chemistry, and green engineering course designed for undergraduate engineering students.

Chem 145: Industrial Organic Chemistry meets all of the learning objectives for the traditional organic chemistry course for engineers while using the 12 Principles of Green Chemistry and green engineering as the spine of the course.

This approach to green chemistry educates the engineers of tomorrow about the benefits of green chemistry that can be employed in their co-op appointments and professional engineering careers. Assessment results demonstrate that green chemistry principles can be incorporated into the organic chemistry course without losing content and increases students interest in the application of chemistry.



## 2009 Michigan Green Chemistry Governor's Award Nomination

### SAE International

### *Professional Development Green Automotive Technology Courseware*

SAE's Professional Development program has a long history of providing high-quality educational seminars and learning products that support the design, implementation, and advocacy of greener processes. In the context of SAE learning programs, greener processes applies to technologies that represent either more fuel efficient or cleaner, more environmentally friendly vehicle powerplants.

While most of the courses were developed just in the last year or so, several date back to the 1990s, which is testament to SAE's early commitment to equipping the vehicle engineering community with learning opportunities that advocate for greener processes. Just in the past two years, more than 2,300 engineers and technical professionals in the ground-vehicle industries have completed these classroom or virtual courses and presumably used those learning experiences to influence the ongoing design of more fuel efficient, cleaner vehicle technologies.



## 2009 Michigan Green Chemistry Governor's Award Nomination

# Michigan Technological University

## *Future Fuels from Forests: Education Modules for Cellulosic Ethanol Production for Women in Engineering and Summer Teacher Institute at Michigan Tech*

Michigan Tech conducts a number of outreach programs to involve students, teachers, and the general public in science, technology, engineering, and mathematics (STEM) activities. Two programs that reach different audiences are the Women in Engineering Scholarship Program (WIE) and the Summer Teacher Institute (STI). For both of these WIE and STI programs, we developed a green chemistry module on biofuels from woody biomass termed "Future Fuels from Forests", which focuses on the conversion stage in the life cycle of biofuels.

The goals of the module are to teach about using renewable feedstocks in chemical and fuel production, to provide hands-on experiences in the laboratory to produce ethanol from wood chips, and to increase interest by students and teachers chemical engineering as a profession.



## 2009 Michigan Green Chemistry Governor's Award Nomination

# Chemistry Department, Grand Valley State University

## *Green Chemistry Integration in the University Curriculum*

Two green chemistry courses, a green chemistry certification and a strong environmental program place the Chemistry Department at Grand Valley State University (GVSU) at the forefront of green chemistry education in Michigan.

GVSU offers a Bachelor of Science degree with an emphasis in environmental chemistry. Tradition and experienced faculty converged well with new green chemistry courses leading to the inception of a 'Certification in green chemistry' program, a modality to prepare our graduates for integration into the workforce and to provide them with a competitive edge for the job market.

As organizers of the 1st Michigan Green Chemistry Education Network conference and the publishers of MIGreen newsletter, we are building the scaffold for a constructive and productive collaboration among institutions, state-wide, to the direct benefit of our students and the quality of future workforce in Michigan.

**2009  
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## 2009 Michigan Green Chemistry Governor's Award Nomination

### SAE International

#### *A World in Motion Fuel Cells Curricula for Grades 6-8*

A World in Motion (AWIM) curricula brings math and science principles to life through highly interactive, hands-on learning experiences that incorporate the laws of physics, as they relate to motion, flight, energy and electronics.

In the Fuel Cell Challenge, students receive a letter from a fictitious toy company interested in receiving new designs for toys that are environmentally friendly and are powered with alternative power sources and fuels. Students work in teams to design a vehicle that can meet specific performance goals. The program culminates in student presentations of their working models and a discussion of the design teams' efforts to address the challenge.

Over the course of the curriculum, a variety of activities introduce students to the development and use of fuel cells, types of fuel cells, and hands-on experiments with a PEM (proton exchange membrane) fuel cell to produce electricity to power an electric motor.



## 2009 Michigan Green Chemistry Governor's Award Nomination

### Skyline High School

### *Green Chemistry Curriculum Development and School-Wide Implementation Project*

Skyline High School has successfully helped to develop curriculum units in Green Chemistry, Green Math and Engineering, and Green Technology which are implemented concurrently at all levels of the curriculum at the school. In the 2009-2010 school year the school will pilot the first semester-long required high school course in green chemistry.

Teachers from Skyline have been working in an increasingly vital role with the Beyond Benign Foundation for Green Chemistry which is a non-profit organization founded by Dr. John Warner. The teachers at Skyline are acutely aware that their students will provide the technological future of Michigan and that green chemistry is the perfect fit of innovation and application of STEM (Science, Technology, Engineering and Math) concepts that get students excited about the real world implications of their academic learning.





**2009**

**Michigan Green Chemistry  
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**PUBLIC CATEGORY**

## 2009 Michigan Green Chemistry Governor's Award Nomination

# The Great Lakes Green Chemistry Network Telephone Seminars

## *Great Lakes Green Chemistry Network*

The Great Lakes Green Chemistry Network (Network) was formed in 2006, with the goal of promoting the practice of green chemistry throughout the binational Great Lakes region. The Network focuses on providing networking and dialoging opportunities among four key sectors: industry, academia, government, and NGOs.

As part of this effort, the Network initiated its free telephone seminars in January, 2008, as a means of sharing ideas, developments, information, and initiatives in green chemistry across all sectors. This monthly telephone seminar offers a unique opportunity for a diverse audience interested in green chemistry to explore diverse aspects of this growing field.



## 2009 Michigan Green Chemistry Governor's Award Nomination

### Ecology Center

#### *Advocating for Green Chemistry Policy for Michigan*

Since 2006, the Ecology Center (the Center) has sought to advance the practice and teaching of green chemistry in Michigan by advocating for policy change, educating and mobilizing citizens, participating in multistakeholder initiatives, and building a base of support for green chemistry activities among environmental, health professional and health-affected organizations, elected representatives, government agencies, business leaders, educators, private foundations, public institutions and others.

The overall goal of the Ecology Center's green chemistry effort is to protect public and environmental health while supporting sustainable economic development. In all our efforts, the Center is focused on accelerating the timeline for this transformation.

The Center advocated at all levels for a Executive Directive 2006-6 on green chemistry to put Michigan in a leadership position nationally on the issue.

**2009  
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Winner**





**2009**  
**Michigan Green Chemistry**  
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**STUDENT CATEGORY**

## 2009 Michigan Green Chemistry Governor's Award Nomination

# Benjamin Weihl, Ronald Allison, Jason Gerard, and Paul Miller, Electrical Engineering Majors, Saginaw Valley State University *Renewable Energy Powered Carts for University Use*

With a goal to eliminate the use of fossil fuels for on-campus vehicles, the team undertook a project looking at the feasibility of using 100 percent renewable resources to charge an electric cart for campus use.

Both sun and wind energy were used as the power source to charge a battery array. An inverter was used to convert DC voltage to AC and the battery array proved instrumental in storing generated energy for later use.

Our successful project eliminated the use of coal powered generators to charge an electric cart throughout the experimentation process.



## 2009 Michigan Green Chemistry Governor's Award Nomination

# Nathan Craft, Chemistry Major, Grand Valley State University

## *Cyclic Polyols in Transfer Hydrogenation*

Cyclic polyols and cyclohexene derivatives were investigated as possible hydrogen donors in transfer hydrogenation reactions. Hydrogenation is a fundamental chemical reaction and a core technology in chemical synthesis, utilizing hydrogen gas or other sources of hydrogen. Our goal was to investigate the effectiveness of various compounds as hydrogen donors and explore the capabilities of functional groups other than alkenes to influence the hydrogen donation abilities of a given structure.

The significance of this project is based on the growing demand for efficient methods of asymmetric transfer hydrogenation and potential hydrogen donors useful in large scale applications. The potential application of our experiments would be significant in that if successful, companies in Michigan could apply this greener hydrogenation process in their synthesis of specific drugs and other specialty chemicals.

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## 2009 Michigan Green Chemistry Governor's Award Nomination

# Jessica Rae Mallo, Architecture Major, Lawrence Technological University

## *The Precipice*

The earth is in crisis. Creating a museum focusing on the elements and their attributes is the first step in building a cleaner world. A building set to create a new mindset, where man uses natural elements to create energy and clean the planet.

The population must learn how to use earth's natural resources to fuel and infuse our lives in order to purify our activities and our world. Architecture must encourage the desire to learn. Therefore, the museum will be a significant structure, exploring material use for the envelope of the new world education.

The project employs accepted museum spaces while housing atypical programs consisting of extensive research and innovative energy collection and production techniques. This elemental museum will form the new horizon, the place where the elements converge into a fine line of research and education.

