The Sustainability Scoop

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A Plausible Revolution in Green Chemistry:

UCSB Professor Bruce Lipshutz's sustainable research introduces a safer, cost-effective option to rid organic chemistry labs of organic solvents.

By: Karen Housel

Aiming to reduce the ecological footprint of major companies in the fine chemicals arena, UCSB Chemistry Professor Bruce Lipshutz and his team of researchers are eager to share their findings that could reduce organic waste in many of the laboratories that develop drugs, agrochemicals, and flavors and fragrances. The solution lies in a substance we are all very familiar with -- water.

Lipshutz has found a way to use water as a medium for dissolving reactants and catalysts, rather than the toxic organic solvents commonly used in laboratory environments. He explains that for many companies in the chemical industry, for every kilogram of product, (e.g., drug produced), there could be as much as 50-200 times that amount produced in pure waste. This waste, over 70% of which is associated with organic solvents, is hazardous and must be treated and disposed of responsibly. Using water rather than organic solvents to conduct experiments provides a safer, healthier work environment.

Lipshutz's method of using water as a solvent relies on a "designer" surfactant, which is used in very small amounts and is based on vitamin E. It is inexpensive to make, well-behaved, and stable.

By adding just a touch of magic to water, nanoreactors are formed in which the reactions take place. Due to the overcrowded state within these particles, no heat is needed to do the chemistry. "We're mimicking what nature has done all along," Lipshutz said in a recent interview.

Currently, Lipshutz is spreading his idea by presenting his research worldwide. "We're developing relationships with companies to help simplify their experiments," Lipshutz said. "We are working hard to get organic solvents out of organic reactions."

UCSB Sustainability applauds Professor Lipshutz for his innovative research in green chemistry.□

"We're mimicking what nature has done all along."
-Bruce Lipshutz, UCSB

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UCSB's Water Action Plan: Conserving Today for Tomorrow

By: The Bren WAP Group

Fresh water is a limited resource with several competing uses that pose an ever-increasing burden on water supplies. In California, water supply issues are magnified by the state's growing population and semi-arid climate. In order to better prepare for current and future challenges regarding water supply, six students from the Bren School of Environmental Science & Management are working to produce a Water Action Plan (WAP) for UCSB, which will also serve as their Master's Thesis.

The WAP seeks to build upon the school's historic water practices that have allowed the University to surpass California's 20% water-use reduction mandate nine years in advance. The Plan will examine UCSB's historical and current water use data on the following water types: potable, non-potable, wastewater, stormwater, industrial, reclaimed, and graywater. The WAP Group has also collaborated with regional and University stakeholders to identify and evaluate strategies for water reduction and explore education and outreach opportunities pertinent to on-campus water conservation. Upon completion, the Water Action Plan will be implemented under the University's UC Sustainable Practices Policy; the guidance document will enable UCSB to minimize water usage while meeting growing demands of future water users.

As the first of its kind in the UC system, the UCSB WAP will be designed with transferability in mind. It will offer site-specific water conservation strategies for UCSB and will serve as a comprehensive template for external water action plans. The WAP Group acknowledges the wide range of water needs and uses across the UC System. From agricultural water demand to hospital water demand, each UC faces its own water challenges, but underlying the differences between universities is a common goal -- water conservation. The UCSB WAP will lay out a systematic approach to designing a water action plan with the ultimate goal of maximizing water conservation.

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Regardless of each university's individual challenges, the UCSB WAP will emphasize key components and analytic processes necessary to developing a thorough and thoughtful water action plan. The graduate students working on the project hope to facilitate collaboration within and among universities to encourage creativity and information sharing that will maximize water conservation efforts across the board.

Currently, the WAP Group is in the process of writing the Plan. The WAP Group will be producing a document for their Bren School Master's Thesis and a guidance document for UCSB. The WAP Group will defend their thesis in late February and present the final report, which will be open to the public, in mid-April. More information about the project, group members, and project deliverables can be found on the WAP Group's website, http://www2.bren.ucsb.edu/~wateraction/.□

Minimizing Environmental Impact: The Start of a Sustainable Chemical Enterprise

By: Karen Housel

UCSB Professors Peter Ford, Susannah Scott, and their team developed an innovative center dedicated to researching sustainable chemistry.

CenSURF, the Center for the Sustainable Use of Renewable Feedstocks, aims to create a sustainable chemistry that replaces nonrenewable petrochemicals used in chemistry labs with plentiful, naturally abundant feedstocks. Founded by Professors Peter Ford, Susannah Scott and their colleagues, CenSURF facilitates research which will ultimately find ways to create valuable and useful complex chemicals using elements such as carbon dioxide and renewable biological materials.

This research is vital to a growing world dependent on chemicals from unsustainable sources, such as oil, that will be depleted in the future.

Developing new technologies to create more efficient uses of resources is key in CenSURF. "We hope to train a lot of students who will take these methods and apply it to their own companies leaning towards sustainable technologies," Professor Scott explained, "Our goal is to outreach to the general public, other scientists, and to inspire involvement and awareness."

Ford and Scott explained that some of their motivation for the creation of the center was due to research collaborations with Chinese scientists, involving travel in China. "China has more than a billion people who want the same standard of living we have, and you see how tremendously destructive this is," Ford explained in a recent interview. He explains that everyone deserves to live affluently, but we must move from a reliance on finite resources like petrochemicals to renewable biological materials to make a difference for the future of the planet.

CenSURF emphasizes the creative use of catalysts and electrochemical processes to produce complex carbon compounds from renewable carbon sources that may lead to new discoveries and green technologies. UCSB Sustainability admires Professors Scott and Ford for their initiative and passion to facilitate research in sustainable chemistry.□

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