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Upcoming CAS events

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Update your information

FACULTY Story

- Dr. Gellert Mezei, associate professor of chemistry, awarded NSF grant to study potentially damaging contaminants in lakes, rivers

ALUMNI Profiles

- Gregory C. Johnson `91 appointed as the next administrator of the Maryland State Highway Administration
- Lori Taylor `82 named deputy director of Oakland County human resources department
- Volunteer Kalamazoo has named Mario Gonzales `11 as program manager

STUDENT Story

- Caitlyn Perry Dial, Ph.D. candidate in history, has made the disaster of the Eastland the focus of her dissertation

Dr. Dustin M. Hoffman `13 is the recipient of the 2015 Prairie Schooner Book Prize for fiction

CAS

WMU wins NSF grant to study contaminants in industry, agriculture

BY MARK SCHWERIN
SEPTEMBER 4, 2014 | WMU NEWS

Anions produce lake algae.

KALAMAZOO, Mich.—A Western Michigan University researcher has been awarded a $284,833 grant from the National Science Foundation to study negatively charged ions that are potentially damaging to lakes and rivers when found in fertilizers and also are a toxic byproduct in waste from manufacturing and mining.

The grant was awarded to **Dr. Gellert Mezei**, associate professor of chemistry, who has been studying negatively charged ions, also known as anions, for over 10 years. Mezei's research ultimately could further understanding of how anions can be extracted from industrial and mining waste and removed from enriched bodies of water. Anion removal also has implications for the petroleum, pharmaceutical and nuclear power industries.

WHAT ARE ANIONS

Anions (pronounced an-ions) are extremely common, Mezei says. They are often found in water, in the human body and the surrounding environment.

"They are ubiquitous," Mezei says. "They are everywhere in nature. Our body functions are based on several anions that are vital. Many anions are part of minerals. They are necessary ingredients in fertilizers."

But they can also cause big problems. Anions in the form of sulfates, nitrates, phosphates and chlorides can be extremely damaging in bodies of water and can contaminate lakes, rivers and streams, leading to excessive growth of algae and lake eutrophication.

"So it's important to monitor them and devise ways of reducing their concentration and also eliminate them from contaminated areas," Mezei says. "For example, our own Asylum Lake has over 10 times more sulfate than what it should normally have. So these anions will lead to excessive growth of algae and ultimately can lead to eutrophication of the lake."

Anions in the form of chlorides from road salt also cause extensive damage to lakes and streams.

"We have these bad winters in Michigan, and we use a lot of sodium chloride, calcium chloride and other chlorides on the roads and these end up in our bodies of water," Mezei says. "And then there are the toxic anions."

TOXIC ANIONS

Toxic anions are common in industry and mining in the form of chromate, arsenate, selenate and dozens of other substances. These are doubly charged negative ions that have a high affinity for water, are carcinogenic and have been linked to other diseases. In small amounts, they can attack the nervous and reproductive systems, kidneys and blood, and cause birth defects. The permissible levels of toxic anions are continuously being lowered as their harmful effects are more fully understood.

Chromium, for example, is used extensively in industry for plating to produce glittering, sparkling surfaces common on cars and other products. And nuclear waste contains several toxic anions, which interfere with the disposal process.

"They like to stick to water and stay in water, so that makes their extraction difficult," Mezei says.

That's where Mezei's research comes in.

"In general, the idea for all these different applications is that one or more anions of interest have to be removed," Mezei says. "Unfortunately, it is not that easy to remove one problematic anion from a mixture because many anions are very similar to each other. Our project hopes to address this issue."

The problem is not all anions are bad. Removing them all would increase the cost of removal several hundred times.

"These extraction agents we have discovered are very, very efficient in that they bind the anions extremely strongly," Mezei says.

PROMISING USE IN OIL INDUSTRY

Mezei and his fellow researchers have discovered that the removal agents also show great promise in preventing and even removing scale in the oil industry. Scale is an unwanted substance that builds up in piping and pumping equipment and comes from seawater that is pumped into wells. Production must be halted regularly to scrape it out. Removal agents can be used to extract anions from the seawater before it is used, reducing scale formation, or simply use them to dissolve the scale itself.

"Scale removal can cost the oil industry a million dollars a day," Mezei says. "It's a huge problem."

The NSF grant does not directly fund Mezei's anion extraction research. What it pays for is basic research into how the extraction method works. Why do the extraction agents remove the anions with the highest affinity for water and leave the anions that have a lower affinity for water? The grant project will try to answer that question and help in designing even more effective and selective anion extraction agents.

"We know it works," Mezei says, "but what no one knows is why and how it works."

Michigan official appointed to head Maryland State Highway Administration

http://www.wbaltv.com/politics/longtime-michigan-transportation-appointed-to-head-maryland-sha/34198078

Davisburg resident named deputy director of Oakland County human resources

http://www.theoaklandpress.com/government-and-politics/20150713/davisburg-resident-named-deputy-director-of-oakland-county-human-resources

Mario A. Gonzales named program manager for Volunteer Kalamazoo

http://www.mlive.com/living/kalamazoo/index.ssf/2015/07/volunteer_kalamazoo_welcomes_m.html

The Eastland's historic sinking killed hundreds.

Why isn't it remembered more?

http://michiganradio.org/post/eastlands-historic-sinking-killed-hundreds-why-isnt-it-remembered-more#stream/0