KEEPING OUR PLANET GREEN

Left to Right: Benjamin Tutolo and Simone Pujatti, University of Calgary.

SOLUTIONS FOR CARBON EMISSIONS

When researchers from the University of Calgary dove deeply into the makeup of rocks from the ocean floor, what they found was both surprising and has implications for mitigating climate change. Using our BMIT beamline, they discovered much larger pores than expected in samples from the Earth's crust. These porous rocks, which are also found in mountainous areas in British Columbia and Newfoundland, could potentially be used to sequester carbon.

DOI: 10.1016/j.agsl.2022.110806

A CLEANER PATH TO HYDROGEN PRODUCTION

Hydrogen fuel could be key in transitioning to cleaner forms of energy. While creating hydrogen through electrolysis generates no carbon dioxide, the process is expensive and needs a lot of electricity. Researchers from McGill University found a way to make the process more efficient and stable. Their method combines water with an organic compound that's produced when plant material such as pulp and paper residue breaks down. They were able to double the production of hydrogen using the same amount of electricity. The scientists used the CLS to study the copper-based catalyst they developed to speed up the water-splitting reaction.

DOI: 10.1016/j.srq.2025.170695

AI ACCELERATES CLEAN HYDROGEN PRODUCTION

Trial and error experiments are a lot like trying to find a needle in a haystack. Researchers at the University of Toronto are using artificial intelligence (AI) to accelerate scientific breakthroughs in the search for sustainable energy. They used the CLS to confirm that an AI-generated "recipe" for a new catalyst offered a more efficient way to make hydrogen fuel. The AI program the team developed took over 36,000 different metal oxide combinations and ran virtual simulations to assess which combination of ingredients might work the best. Using the CLS, the researchers were then able to analyze the catalyst's performance during an actual reaction.

DOI: 10.1021/jacs.4c01555

CLEANING CONTAMINATED WATER WITH FLAX

Using the CLS, a team of researchers from the University of Saskatchewan (USask) found that a common agriculture byproduct can treat waste water contaminated by antibiotics and other pharmaceutical chemicals. In this study the scientists demonstrated that flax shives that have been treated with heat and steam adsorb the medication carbamazepine from wastewater. Flax shives are the material left after fiber is extracted from flax stems. They hope that by creating adsorbents that are inexpensive and easily accessible, they can attract the attention of businesses looking for more efficient ways to treat wastewater.

DOI: 10.1016/j.chemd.2022.11.008

TOWARDS GREENER CEMENT

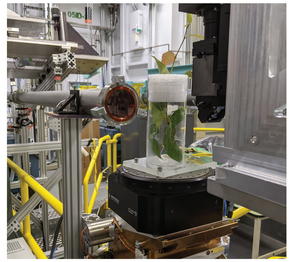
Production of cement accounts for 8 to 10 percent of total global greenhouse gas emissions. Researchers at the University of Saskatchewan are studying whether biochar – a fine, carbon-rich powder made from burned plant waste – can replace some of the cement used to produce concrete. The team found that concrete made with biochar is stronger and less porous than regular concrete. Now they're testing how the biochar-enhanced concrete holds up over the longer term. Adopting this new "recipe" could cut emissions and make use of plant material that would otherwise go to waste.

DOI: 10.1016/s41598-025-07210-3

NATURE'S DEFENSE AGAINST CHANGING CLIMATE

Researchers from the University of British Columbia used the CLS to look inside two types of balsam poplar saplings, to learn more about how their water transport system is affected by lack of moisture in soil. Under normal conditions, water is transported from the roots of a tree to its leaves through a continuous column of water. However, in drought conditions pockets of air form in that column, blocking the transport of water and nutrients to the leaves. The UBC team discovered that balsam poplars use their xylem fibers to store water then subsequently release it into the xylem's vessels, the pipe-like cells that house its hydraulic column – reducing the risk of air pockets forming there.

DOI: 10.1111/pcd.14040



Balsam poplar sample on our BMIT beamline.

TURNING MINE WASTE INTO HEALTHY SOIL

A team led by researchers at the University of Queensland has developed an innovative method to turn harmful mine tailings into healthy soil. The scientists used our SM beamline to determine the underlying mechanism of their process, which involves promoting the growth of specific microbes in tailings that have been amended with plant mulch from agricultural waste and urban green waste. These microbes "eat" the organics and minerals in tailings, transforming them into functional aggregates (or soil crumbs), the building blocks of healthy soil. The new process can also be used to restore soils damaged by over-farming, overuse of fertilizers, and climate change.

DOI: 10.1021/acs.est.3c05011