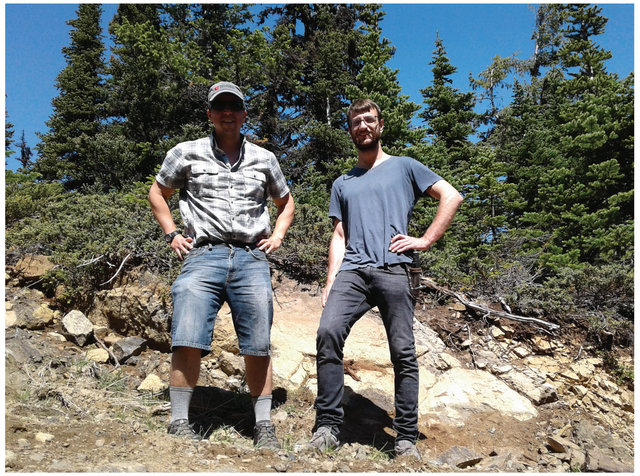
KEEPING OUR PLANET GREEN



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.epsl.2023.118006

SOAKING UP MARINE OIL SPILLS

Oil spills, if not cleaned up quickly and effectively, can cause lasting damage to marine and coastal environments. Using our Mid-IR beamline, researchers from Memorial University, Newfoundland and University of Texas – Arlington are developing a new sponge-like material that is not only effective at grabbing and holding oil on its surface (adsorption), but can be reused again and again—even in cold water. The special material combines a biodegradable cellulose-based material with a substance called spiropyran, which is light sensitive. Because spiropyran can switch between being oil-sorbent and oil-repellent, the new aerogel can be used to soak up and squeeze out oil – just like a kitchen sponge.

DOI: 10.1016/j.colloids.2024.131651

Biochar samples in the lab.

USING WASTE WATER TO GROW BETTER CROPS

Scientists from the University of Idaho are helping close the loop on the sustainability cycle with research into nutrient-enhanced biochar. The team is focused on improving biochar – which can be used as an amendment to promote soil health– by adding phosphorus recovered from wastewater. A limited resource typically mined from the soil, phosphorus is a crucial nutrient for crops. Biochar is an effective sponge that can soak up phosphorous and other nutrients, like nitrogen, from waterways.

DOI: 10.1371/journal.pwat.0000092

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.cherd.2022.11.008

ADDING CALCIUM TO SOIL TO TRAP CARBON

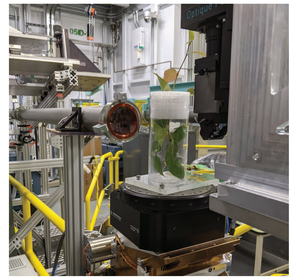
Farmers add calcium to their soil for many reasons related to increasing crop yields– including regulating pH and improving soil structure. Using the CLS, researchers from Cornell University and Purdue University have identified a previously undiscovered mechanism triggered by calcium when it's added to soil. They showed that adding calcium to soil changed the community of microbes in the soil and the way the microbes process organic matter. Calcium enabled them to process it more efficiently, with more carbon retained in the soil and less CO2 released into the atmosphere. Their finding could lead to more strategic use of the mineral in agriculture.

DOI: 10.1016/s41467-023-42291-6

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/ppl.14048



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: 10.3025/acs.ext.3v010/11