MATERIALS FOR THE FUTURE

BUILDING BETTER HYDROGEN PIPELINES

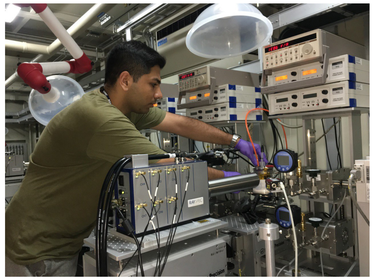
The steel used to make pipelines can be weakened by hydrogen molecules introduced during manufacturing or when the pipeline is transporting oil and gas. University of Saskatchewan researchers used the CLS to generate 3D images of the cracks that form inside the steel to better understand what happens at a microscopic level. They found that the amount of hydrogen that stays inside the steel, and where it accumulates, has the largest impact on whether a pipeline will fail. This new information can be used to develop steels that are more resistant to cracking.

DO: 10.1016/j.engfailanal.2025.109411

BUILDING BETTER CATALYSTS TO CONVERT CARBON DIOXIDE

One way to address climate change is to capture CO2 emissions and convert them to other useful chemicals, such as methanol. In order to turn CO2 into methanol, you need a catalyst to jump-start the electrochemical reaction. Traditionally, these catalysts have either been made out of precious metals like gold or palladium, or base metals such as copper or tin. However, these materials are expensive and break down easily, hindering large-scale implementation. Researchers from the University of Waterloo developed a metal-free catalyst that is cheaper and more durable than metal ones, and is easy to fabricate. The team credited our SM beamline as being in instrumental to their discovery.

DO: 10.1021/acscatal.2c05955



Ali Feizabadi, Western University

COMBINING METALS FOR BETTER FUEL CELLS

Fuel cells are seen as a promising source of green energy, with the potential to revolutionize various industries including transportation and power generation. While most research in this area has focused on cells that use platinum as the catalyst, there's a scarcity of the material, it's costly, and it's not particularly stable. Researchers from Western University discovered that incorporating other metals reduces the amount of platinum that is required to produce energy, and results in a more stable catalyst for fuel cells. Their breakthrough has the potential to make fuel cells more economically viable and environmentally friendly, driving the broader adoption of clean technologies.

DO: 10.1021/acs.jpcc.3c04234

SMART PACKAGING FOR SAFER FOOD

Printed electronics are already being used to make everything from solar cells for vehicle roofs to flexible displays on smart phones. Researchers from Simon Fraser University and the University of Saskatchewan developed a material that stores up to 1,000 times more charge than current forms of printed electronics. It also shows promise in its ability to function in both positive and negative voltage modes, a must for the type of circuitry and advanced operations that will be required to make the Internet of Things a reality.

DO: 10.1021/acsami.4c01045

MEETING THE NEED FOR MAGNETIC MATERIALS

Magnetic materials are super important because they are the backbone of many modern technologies. Using the CLS, researchers from the University of British Columbia discovered a new, adjustable magnetic material made of common elements. The material may one day make our everyday electronics, such as cell phones, cheaper and more environmentally friendly, as current magnetic materials are rare and difficult to mine. Our REIXS beamline was a critical tool in quantifying the material's behaviour, which helps the researchers know its potential applications.

DO: 10.1021/jacs.2c06768

PEROVSKITES & SOLAR ENERGY

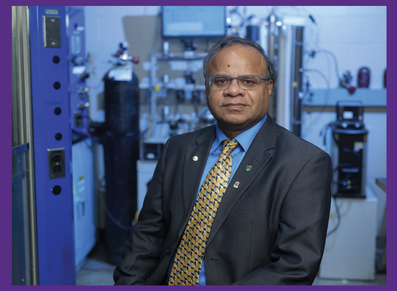
Silicon has long been the standard material used for solar cells, but perovskites, materials based on the same crystal structure as calcium titanium oxide, are becoming the preferred alternative for fabrication. A University of Toronto team has used the CLS to research the capabilities of perovskites in solar cells. Our ultra-bright light showed the never-before-seen transformation of a 3D crystal into a high efficiency solar cell material. Their insights could lead to solar cells that are cheaper and more efficient.

DO: 10.1038/s41467-021-22619-9

HEATING OUR HOMES WITH LEFTOVER CANOLA

A University of Saskatchewan researcher's exploration of canola meal pellets as an eco-friendly alternative to coal and natural gas for both heat and energy is poised to move into its next phases: sclaed-up pellet production and commercialization. His quest is to find ways to turn leftover materials from crop production, like canola meal, into biocoal.

DO: 10.1016/j.fbioeco.2021.09.134



Ajay Dalai, USask

NEW "SLIME" FOR GREEN ENERGY AND MEDICAL APPLICATIONS

University of Guelph researchers developed a slime-like material that produces electricity when compressed. When they studied their prototype using the CLS, they discovered the material has an array of potential applications. For example, installed in floors, the material could produce clean energy when people walk on it. The slime is 90 per cent water plus oleic acid and amino acids, so it's highly compatible with the body. It could also potentially be used to make bandages that actively promote healing. By increasing the electrical fields that our bodies already produce, the new material could attract healing cells to an open wound.

DOI: 10.1016/j.nanoEng.2024.100033.