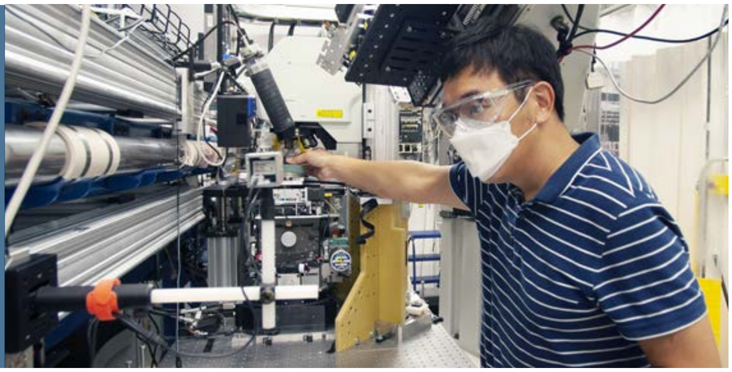
CLIMATE AND THE ADVANCED PHOTON SOURCE



Assistant Physicist Wonsuk Cha of the Argonne X-ray Science Division Microscopy Group adjusts the sample stage in the 34-ID-C research station at the APS.

Scientists using the U.S. Department of Energy's (DOE's) Advanced Photon Source (APS) at Argonne National Laboratory carry out a wide range of research with potential impacts on climate-related problems.

Here are just a few examples.

• Increased reliance on solar energy would reduce consumption of fossil fuels and limit emissions of climate-changing gases, so industry is always on the hunt for better solar technology.

Lead iodide perovskites are promising candidates that match the efficiency of current technologies and cost less, but most of them are less stable than the industry standard and best manufacturing practices for lead iodide perovskites are not well understood.

Researchers used the APS to gain a better idea of how manufacturing conditions can deliver solar cells that are as perfect as possible, with large, well aligned crystalline grains.

• One proposed paradigm for shifting away from fossil fuels is the hydrogen economy, in which hydrogen gas powers society's electrical needs.

To mass produce hydrogen gas, scientists are studying the process of splitting water (two hydrogen atoms and one oxygen atom), yielding hydrogen fuel and breathable oxygen gas.

Research at two U.S. DOE x-ray light sources including the APS solved a key, fundamental barrier in the electrochemical water splitting process and demonstrated a new technique to reassemble, revivify, and reuse a catalyst that allows for energy-efficient water splitting.

• For a half-century, materials scientists have been investigating the effect of defects in metals. The evolution of imaging tools has created opportunities for exploring similar phenomena in other materials, most notably those used for energy storage.

X-ray nanoimaging at the APS gave researchers an unprecedented view into solid-state electrolytes, revealing previously undetected crystal defects that could provide a path for increased ionic conductivity, and that may now be leveraged to create superior energy storage materials.

This research used resources of the Advanced Photon Source, a U.S. DOE Office of Science user facility operated for the DOE Office of Science by Argonne National Laboratory under Contract No. DE-AC02-06CH11357

To access years of APS research highlights, use the QR code below.

Media inquiries: bschlesinger@anl.gov
APS information: fenner@anl.gov
APS web site: www.aps.anl.gov/

Argonne National Laboratory is a U.S. Department of Energy laboratory managed by UChicago Argonne, LLC.

PSC_October 2021