

ORNL's research reactor revamps veteran neutron scattering tool

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The Cold Triple Axis spectrometer, now in commissioning at Oak Ridge National Laboratory's High Flux Isotope Reactor, moves by way of air pads on an epoxy surface known as the "dance floor."

The Cold Triple Axis spectrometer, a new addition to Oak Ridge National Laboratory's High Flux Isotope Reactor and a complementary tool to other neutron scattering instruments at ORNL, has entered its commissioning phase.

The CTAX uses "cold" neutrons from the HFIR cold source to study low-energy magnetic excitations in materials. Cold neutrons are slower than their "thermal" neutron counterparts, and thus perfect for probing low-energy dynamics.

The instrument, which moves by way of air pads on an epoxy surface known as the "dance floor," is one of only two of its kind in the United States. Following commissioning, it will be available for users this coming spring.

"Neutrons have unique properties that make them ideally suited to study the complex atomic-scale interactions that govern the macroscopic physical and chemical properties of materials," said Jaime Fernandez-Baca, leader of the Triple Axis group.

The types of materials studied by instruments like CTAX and the new Cold Neutron Chopper Spectrometer (CNCS) at ORNL's Spallation Neutron Source (SNS) include energy and electronic technology-related materials such as those used in solar cells, data storage, batteries, superconductors and materials with potential applications in electronic devices.

"While the CNCS at SNS provides snapshots of broad ranges of energy and wave vector space, the CTAX at HFIR allows for a very detailed and focused view of small regions of this space," Fernandez-Baca said.

"With the information provided by these two types of instruments, we get a more thorough view of the materials being studied, enabling us to design and make novel materials to meet technological challenges."

The original CTAX instrumentation was developed at Brookhaven National Laboratory by a Japanese team as part of the U.S.-Japan Cooperative Neutron Scattering program. DOE's Office of Science funded its relocation and modification for use at ORNL.

CTAX offers better energy and momentum resolution than most of the other neutron scattering instruments, as well as the flexibility to observe materials under a variety of sample environmental conditions like high and low temperatures, high pressures and magnetic and electric fields.

The use of polarizing neutrons to study magnetic excitations will also be implemented at CTAX.

As part of the U.S.-Japan agreement 25 percent of time on CTAX will be used by ORNL and Japanese researchers for experiments performed under this collaboration. The greater 75 percent of use will be allocated to general users from university and research institutions.

Provided by Oak Ridge National Laboratory

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