NUCLEAR SEMINAR SERIES

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4:00 pm - Rm 184 NSH

Improving predictions of nuclear reaction cross sections via precision measurements at Los Alamos Neutron Science Center (LANSCE)

In nuclear applications including nucleosynthesis network calculations or device-performance simulations, available nuclear physics inputs are limited to the measurements on stable or accessible radioactive nuclei, remaining thousands of reactions to rely on the theoretically predicted reaction rates. Hauser-Feshbach (HF) formalism is widely used to predict these reaction cross sections, however difficulties like renormalizations of calculated neutron-induced reaction cross sections to experimental observables, or shape discrepancies of neutron-induced charged particle reaction cross sections below 10 MeV among different HF codes have been addressed.

At Los Alamos Neutron Science Center (LANSCE), neutrons are produced in the energy range of thermal to several-hundred MeV. Direct, high-precision measurements on neutron-induced reactions allow us to validating HF nuclear input parameters through advanced nuclear reaction modeling for enhancing the fidelity of these theoretical predictions. Recently developed LENZ (Low Energy NZ) instrument is optimized to investigate double-differential cross sections on (n,p) and (n,α) reactions with the focus of low detection thresholds and large solid angle coverage.

I will present the on-going LENZ effort on the precision measurements of the ^{16}O(n,α) reaction cross section in the interest of nuclear applications due to a high abundance of oxygen in air or cooling water, and of the ^{35}Cl(n,p) reaction in the interest of advanced nuclear reactor designs and fuel cycle facilities. An exploratory project is to measure the ^{56}Ni(n,p) reaction cross section for the neutron energy up to 5 MeV at LANSCE, which is directly to confirm the importance of vp process during neutrino-wind driven environments. 56Ni is a radioactive nucleus with the half life of 6 days, so we have developed the radioactive isotope irradiation and target fabrication techniques at the Isotope Production Facility at LANL. I will update the progress on the benchmark measurement of the IPF fabricated, radioactive ^{59}Ni(n,p) reaction.

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