

First LANSCE result on differential cross sections of the $^{16}\text{O}(n,\alpha)$ reaction

Thursday, 11 November 2021 15:25 (25 minutes)

Oxygen is present in many materials - water, oxides, concrete and elsewhere - and the uncertainties in its nuclear data can have a significant impact on many nuclear applications. The current status of the oxygen-16 data is a 30-50 % discrepancy among various $^{16}\text{O}(n,\alpha)$ and $^{13}\text{C}(\alpha,n)$ cross section measurements. Reconciling these discrepancies and settling on a best value requires new measurements for confirmation.

We have performed the $^{16}\text{O}(n,\alpha)$ reaction cross section measurement using the unmoderated white neutron source with the LENZ (Low Energy NZ-neutron induced charged particle detection) instrument at LANSCE. Double differential cross sections of $^{16}\text{O}(n,\alpha_0)$ and $^{16}\text{O}(n,\alpha_2 + \alpha_3)$ at multiple angles are deduced from this work. The LENZ angular distributions are compared with previous measurements and evaluated cross section libraries. Using the newly developed LENZ postprocessing tool based on the MCNP's PTRAC output, experimental yields are compared with simulated yields using ENDF/B-VII.1 and ENDF/B-VIII.0. Within the experimental uncertainties, we report the 2017 LENZ cross sections with the angle-and energy-integrated ENDF/B-III.0 cross sections using the LENZ's response function. In addition, we will present the 2021 LENZ angular distributions with reduced systematic uncertainties, therefore to be directly used with other experimental data for the R-matrix analysis.

This work benefits from the LANSCE accelerator facility and is supported by the U.S. Department of Energy under contracts DE-AC52-06NA25396 and the U.S. Department of Energy under the Office of Experimental Sciences.

LA-UR-21-29628

Primary authors: LEE, Hye Young (Los Alamos National Laboratory); KUVIN, Sean (Los Alamos National Laboratory); DIGIOVINE, Brad (Los Alamos National Laboratory); HALE, Gerry (Los Alamos National Laboratory); MOSBY, Shea (Los Alamos National Laboratory); PARIS, Mark (Los Alamos National Laboratory); VOTAW, Daniel (Los Alamos National Laboratory); WHITE, Morgan (Los Alamos National Laboratory); ZAVORKA, Lukas (Los Alamos National Laboratory)

Presenter: LEE, Hye Young (Los Alamos National Laboratory)

Session Classification: Session 4