DNP12-2012-020231

Abstract for an Invited Paper
for the DNP12 Meeting of
the American Physical Society

Surrogate reactions for neutron capture with radioactive ion beams[1]

JOLIE A. CIZEWSKI, Rutgers University

Neutron capture reactions are responsible for most of the elements heavier than iron, through either the slow or rapid processes of nucleosynthesis. The r process in particular proceeds through very short-lived nuclei on which neutron capture reaction measurements will never be possible. Knowledge of neutron capture cross sections on short-lived nuclei is also important for applications such as nuclear energy, nuclear forensics, and stockpile stewardship science. When the level density at the neutron separation energy is relatively low, for example near closed neutron shells, direct neutron capture often dominates and direct neutron transfer reactions can provide the spectroscopic information needed to calculate the direct capture. However, when the level density is higher, a compound nucleus is formed and statistical mechanisms dominate the decay. While the formation of the compound nucleus can be calculated with optical models, modeling of the decay is less robust. Because of the importance of neutron capture on nuclei away from stability, there have been efforts to validate surrogate reactions for neutron capture that exploit the availability of beams of radioactive nuclei that interact with light targets where reaction products are measured in coincidence with gamma radiation. This talk would summarize efforts to validate a surrogate for neutron capture and the techniques being developed to measure these reactions with beams of radioactive ions.

[1]This work is supported in part by the U.S. Department of Energy National Nuclear Security Administration under the Stewardship Science Academic Alliances program.