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Neutron Capture Cross Sections of S-process Branch-Point Nuclei

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At certain locations in the s-process path, there are unstable nuclei with beta-decay rates comparable to the neutron capture rates. This opens up a new possible pathway for the s-process: instead of just undergoing beta decay, the radioactive nucleus could also survive long enough to capture a neutron. Hence, the s-process splits into two branches; these special cases are called s-process branch-point nuclei and they are of special interest because they provide information on the stellar neutron density at the s-process site [1]. On the other hand, they are problematic because their (n,&gamma) cross section is usually not accessible via direct measurements. Three such branch-point nuclei are addressed in this project: 185W, 186Re and 186Os, which are of particular interest due to the Re-Os cosmochronology: the 187Re −187Os pair may be used as a cosmochronometer to determine the duration of the stellar nucleosynthesis before our solar system as formed [2]. However, the existence of the above mentioned branch-points induces complications[3]. Hence an improved determination of the (n, &gamma) cross-sections for these nuclei is essential. In this conference I will present the newly determined cross-sections of 184, 185, 186W(n, &gamma) reactions which have been constrained using the experimental nuclear level densities and photon strength functions of 185, 186, 187W nuclei. These statistical nuclear properties were measured at the cyclotron laboratory of Oslo using 186W(d, X) reactions (where X = p, d, t) and beam energy of 13 MeV.

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