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The measurement of the level densities of neutron-rich ^{68}Cu and ^{65}Ni using the evaporation technique with a white neutron beam, and the improved neutron capture rates of ^{67}Cu and ^{64}Ni that are relevant for nucleosynthesis in low neutron exposure conditions.

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We employ a new method to extract the level densities of neutron-rich isotopes by utilizing (n,p) and (n,α) reactions and the evaporation technique to analyze the emitted particle spectra. This level density extraction method is particularly suited to nucleosynthesis at low neutron exposures that typically proceeds by neutron captures along a path extending within a few neutrons away from the valley of stability. In this region, a direct measurement of the relevant reaction rates still remains out of the grasp of experiments. Our method allows for the statistical properties of several relevant isotopes to be studied experimentally to constrain the reaction modeling. In this work, I will present the details of the method and the level densities we extracted for the isotopes ^{68}Cu and ^{65}Ni during our recent experimental campaign at Los Alamos National Laboratory. I will also present improved Hauser-Feshbach calculations of the neutron capture reaction rates on ^{67}Cu and ^{64}Ni for the relevant nucleosynthesis scenarios.We employ a new method to extract the level densities of neutron-rich isotopes by utilizing (n,p) and (n,α) reactions and the evaporation technique to analyze the emitted particle spectra. This level density extraction method is particularly suited to nucleosynthesis at low neutron exposures that typically proceeds by neutron captures along a path extending within a few neutrons away from the valley of stability. In this region, a direct measurement of the relevant reaction rates still remains out of the grasp of experiments. Our method allows for the statistical properties of several relevant isotopes to be studied experimentally to constrain the reaction modeling. In this work, I will present the details of the method and the level densities we extracted for the isotopes ^{68}Cu and ^{65}Ni during our recent experimental campaign at Los Alamos National Laboratory. I will also present improved Hauser-Feshbach calculations of the neutron capture reaction rates on ^{67}Cu and ^{64}Ni for the relevant nucleosynthesis scenarios.

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