EMPIRICAL ESTIMATION OF ASTROPHYSICAL PHOTODISINTEGRATION RATES OF ^{106}Cd AND ^{108}Cd

S. S. Belyshev[1], A. A. Kuznetsov[2], K. A. Stopani[2]
[1]Department of Physics, Lomonosov Moscow State University, Moscow, Russia
[2]Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University, Moscow, Russia

It has been noticed previously in [1] that the ratio between the photoneutron and photoproton disintegration channels of ^{106}Cd might be considerably different from predictions of statistical models such as TALYS [2] and CMPNR [3]. While this doesn't affect the total cross section of photodisintegration, the thresholds of the corresponding reactions differ by several MeV and, therefore, the total astrophysical rate of photodisintegration of ^{106}Cd might be noticeably different from the calculated value. ^{106}Cd is produced in the p-process of stellar nucleosynthesis, which is comprised mostly of photonuclear reactions taking place during the core-collapse supernova phase, and uncertainties of the reaction rates strongly influence the calculated abundances.

We use the bremsstrahlung beam of a 55 MeV microtron and the photon activation technique [4] to measure yields of photonuclear reaction products on targets made of monoisotopic ^{106}Cd and natural cadmium, and obtain absolute yields and cross sections of (γ,n), (γ,p), (γ,np), (γ,2n) reactions on the ^{106}Cd and ^{108}Cd p-nuclides. The obtained results are then used to calculate an estimation of evaluated cross sections, which are in turn used to calculate rates of photoneutron and photoproton reactions on these nuclei at temperatures from 0.1 to 10 GK. It is shown that the resulting rates on ^{108}Cd are in a good agreement with the library values from the astrophysical reaction rate databases, while there is a significant difference in the case of ^{106}Cd, leading to a total difference of photodisintegration rate of up to 50%. The effects of the observed disagreement on the calculations of isotopic abundances are discussed.

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