

Average lifetime of nuclei in stellar and effects on the abundance of elements

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In the astrophysical environment, a large number of high-energy photons will excite the nucleon, together with γ -decay to establish a balance of abundance between the various levels of nucleus. Under the combined action of the excited states and the ground state, the effective decay rate of the nucleon in the astrophysical environment may be quite different from the laboratory. The effective half-life of ^{205}Pb under different temperature and different electron densities is calculated. It is concluded that the effective half-life of ^{205}Pb in the s-process will be reduced from 17.0(9) My in the laboratory to about 100 y due to the influence of the astrophysical environment, leading to a significant decrease in the yield of ^{205}Pb during the s-process, resulting in the abundance ratio of ^{205}Pb to ^{204}Pb in the early solar system was reduced by about 100 times.

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