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Nucleosynthesis of ^{26}Al in Classical Novae: Past, Present and Future[1]

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The ground state of the unstable nucleus ^{26}Al ($t_{1/2} = 7.2 \times 10^5$ yr) decays through the first excited state of ^{26}Mg 99.7% of the time resulting in the emission of a 1.809-MeV γ ray. The distribution of this γ-ray line, first observed in 1979 [1], has been measured along the Galactic plane by several balloon-borne and satellite experiments, confirming the on-going nucleosynthesis of ^{26}Al in the Galaxy. The stellar source of this isotope has been the subject of debate, but current estimates indicate the majority is produced in massive stars, while $20 - 30\%$ is synthesized in classical ONe novae. The situation is further complicated by the existence of an isomeric state at 228 keV (^{26}Al^m: $J^\pi = 0^+$, $t_{1/2} = 6.3$ s), which β decays directly to the ground state of ^{26}Mg, bypassing the emission of the 1.809-MeV γ ray. There are three reaction sequences that produce ^{26}Al^{g,m} in classical novae, and a variety of studies have been performed to determine the rates of the various reactions involved (e.g. [2-4]). A survey of these measurements will be given, as well as the current status of ^{26}Al production in novae. Future plans to accurately determine the reaction rates that dominate the remaining uncertainties in ^{26}Al nucleosynthesis will also be discussed.

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