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The ^{26}Al/^{27}Al isotopic ratio in stellar grains and the stars of the asymptotic giant branch

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Stellar grains are solid samples of stars that were trapped in the interior of primitive meteorites. Lewis et al. first identified stellar grains in 1987. The complex origins of stellar grains have been the topic of research since then. One of the important markers of their origin is a short-lived radioactive nucleus, the ^{26}Al ($t_{1/2}$=0.717 Myr). The strength of the conclusions drawn from the ^{26}Al /^{27}Al isotopic ratio is weakened by uncertainty in nuclear physics. C. Lederer-Woods et al. (2021a, 2021b) remeasured two of the reactions, which consume ^{26}Al (^{26}Al(n,p)^{26}Mg and ^{26}Al(n,α)^{23}Na), they performed their measurements at CERN with the n_TOF instrument. The new reaction rates are lower than previous measurements, and their effects have been examined with the Monash post-processing nucleosynthesis model code. The used models cover the 2-5 solar mass range with Z=0.014 or 0.030. The outcome of the models has been compared with 62 stellar grains from Groopman et al. (2015) and Liu et al. (2021). All the grains are SiC grains, but they belong to separate subclasses. The majority of the included grains are "mainstream"(M or MS) SiC grains (56/62), which category build up most of the SiC grain population. The six other included grains are from the Z and Y subclass, which probably come from low-metallicity stars.
The new reaction rates produce models with a higher ^{26}Al /^{27}Al ratio, but the consequences are not entirely clear since grains from Groopman et al. (2015) tend to have a higher ^{26}Al /^{27}Al ratio than grains from Liu et al. (2021).

Session

Dust and presolar grains

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