TYPE Ia SUPERNOVAE SIMULATIONS AND NUCLEOSYNTHESIS*

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We present nucleosynthetic yields from large-scale simulations of the thermonuclear disruption of a static cold Chandrasekhar-mass $^{12}C/^{16}O$ white dwarf. The simulations are performed with an adaptive-mesh Eulerian hydrodynamics code. We compute the energy generation rate using a crude five-isotope scheme. The deflagration front is propagated by a "thick flame" model that solves an advection-diffusion-reaction equation for a prescribed flame speed and flame thickness. To compute the isotopic yields and their velocity distribution, massless tracer particles are embedded in the star. The initial spatial distribution of these particles is weighted by mass density and the particles are advected using the interpolated fluid velocity, so that the particle ensemble provides a Lagrangian description of the explosion. Along each particle trajectory in (ρ, T) space we evolve a modest (> 200 isotopes) reaction network. For our initial study, we examine how the yields converge with increasing number of particles and explore the effects of varying initial compositions upon our results.

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