



The Beginnings and Ends of Double White Dwarfs

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The Role of Dredge-up in Double White Dwarf Mergers

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We present the results of an investigation of the dredge-up and mixing during the merger of two white dwarfs (WDs) with different chemical compositions by conducting hydrodynamic simulations of binary mergers for three representative mass ratios. In all the simulations, the total mass of the two WDs is $1.0M_{\odot}$. Mergers involving a CO and a He WD have been suggested as a possible formation channel for R Coronae Borealis (RCB)-type stars, and we are interested in testing if such mergers lead to conditions and outcomes in agreement with observations. Even if the conditions during the merger and subsequent nucleosynthesis favor the production of ^{18}O , the merger must avoid dredging up large amounts of ^{16}O , or else it will be difficult to produce sufficient ^{18}O to explain the oxygen ratio observed to be of order unity. We performed a total of nine simulations using two different grid-based hydrodynamics codes using fixed and adaptive meshes and one smooth particle hydrodynamics (SPH) code. We find that in most of the simulations, $> 10^{-2} M_{\odot}$ of ^{16}O is indeed dredged up during the merger. However, in SPH simulations where the accretor is a hybrid He/CO WD with a $0.1M_{\odot}$ layer of helium on top, we find that no ^{16}O is being dredged up, while in the $q = 0.8$ simulation $< 10^{-4} M_{\odot}$ of ^{16}O has been brought up, making a WD binary consisting of a hybrid CO/He WD and a companion He WD an excellent candidate for the progenitor of RCB stars.

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