

MINOR SPECIES DISTILLATION IN CRYSTALLIZING WHITE DWARFS

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We recently developed a new simulation capability that enables very accurate calculations of phase diagrams under white dwarf core conditions [Blouin & Daligault 2021, *PRE*, 103, 043204]. Using this method, we have shown that ^{22}Ne phase separation in a crystallizing C–O white dwarf can lead to a “distillation” process that can delay white dwarf cooling by several Gyrs [Blouin et al. 2021, *ApJL*, 911, 5]. The highly-peaked cooling delay caused by this process appears to be the solution to the ultramassive white dwarf cooling anomaly identified by Cheng et al. (2019) [*ApJ*, 866, 100]. We have also ruled out the possibility of a similar distillation process in O–Ne cores [Blouin & Daligault 2021, *ApJ*, 919, 87]. This severely limits the prospect of transporting large quantities of ^{23}Na toward the center of ultramassive white dwarfs, as needed in the core-collapse mechanism recently proposed by Caiazzo et al. (2021) [*Nature*, 595, 39]