The i-process in super asymptotic giant branch stars

C.L. Doherty\textsuperscript{a,b}, P. Gil-Pons\textsuperscript{c,d}, L. Siess\textsuperscript{c} and S.W. Campbell\textsuperscript{b}

\textsuperscript{a}Konkoly Observatory, Hungarian Academy of Sciences, Budapest, Hungary, \textsuperscript{b}Monash Centre for Astrophysics, School of Physics and Astronomy, Monash University, Australia, \textsuperscript{c}Polytechnical University of Catalonia, Barcelona, Spain, \textsuperscript{d}Institut d’Estudis Espacials de Catalunya, Barcelona, Spain, \textsuperscript{e}Institut d’Astronomie et d’Astrophysique, Université Libre de Bruxelles, ULB, Belgium

Super asymptotic giant branch (super-AGB) stars reside in the mass range $\approx$ 6-12 Msun and bridge the divide between low/intermediate-mass and massive stars. They are characterised by off-centre carbon ignition prior to a thermally pulsing phase which can consist of many 10-1000s of thermal pulses. Super-AGB stars undergo a variety of nucleosynthetic processes including proton-capture reactions at the base of the convective envelope and heavy element (s-process) production during the thermal pulses. The most massive super-AGB stars can also undergo a dredge-out event, whereby a convective helium burning region merges with an inward moving convective envelope. When these zones meet, hydrogen is mixed down to very high temperature regions where a $^{13}$C rich region forms, leading to subsequent neutron release and heavy element (i-process) production. Here we present the first detailed heavy element nucleosynthesis for dredge-out events and discuss how these results could lead to a refining of the mass boundary between high-mass and low-mass stars which has important implications for both the chemical enrichment and energetics of galaxies.

References