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Implosions for Studying Solar CNO Reactions[1] JUSTIN JEET, Lawrence Livermore National Laboratory, YONGHO KIM, Los Alamos National Laboratory, MARIA JOHNSON, Massachusetts Institute of Technology, ALEX ZYLSTRA, Lawrence Livermore National Laboratory — Inertial fusion implosions can be utilized to study nuclear astrophysics. In the 'CNO process', hydrogen burning is catalyzed in the presence of ^{12}C. These reactions are more strongly dependent on temperature than the pp cycle reactions and dominate only in massive stars. For research using ICF facilities, an implosion platform using heavier nuclei in the fuel and capable of creating ion temperatures of at least 30 keV is required. A potential route to reach these conditions is to take advantage of kinetic effects in low-convergence shock-driven 'exploding pusher' implosions. Ion thermal decoupling has been observed in such implosions. While the exact mechanism for shock heating is not clear (collisional vs electrostatic), a significant boost in ion temperature, up to a factor of 6-12x vs a hydrogen ion, is expected for carbon or heavier ions. Shots will be conducted at the OMEGA laser facility using the surrogate reaction ^{13}C + D. Its cross section is substantially higher than the actual astrophysical CNO reactions. The results will inform whether ion decoupling physics occurs according to simple theory and if it can be exploited to generate effective reaction temperatures exceeding 20 keV for relevant CNO reactions.

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