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R-Matrix Analysis of the 13C(α,n)16O Reaction[1] ARTHUR KOCK, GRIGORY ROGACHEV, Texas A&M University - Cyclotron Institute — The ^{13}C(α,n)^{16}O reaction plays a crucial role in the main s-process occurring in low-mass thermally-pulsing asymptotic giant branch (TP-AGB) stars, which produces about half of all nuclei heavier than iron. However, direct measurements of this reaction cross section near the Gamow-peak energy are currently not possible due to very small reaction cross sections. Additionally, available cross-section data at higher energy have some inconsistencies, leading to significant uncertainties in low energy extrapolations. A global R-matrix fit was conducted, using all available data for the ^{13}C(α,n)^{16}O, ^{13}C(α,α)^{13}C, and ^{16}O(n,n)^{16}O reactions. Of particular importance was the inclusion of the fixed ANC for the 1/2+ state at 6.356 MeV in ^{17}O, which was measured recently using the sub-Coulomb α-transfer reaction, as well as the new ^{13}C+α elastic-scattering data measured in the low-energy region $1.6 - 3.8$ MeV. Important constraining information on various resonances was found, and the uncertainty for the astrophysical ^{13}C(α,n)^{16}O reaction rate was dramatically reduced.

[1]Much work on the analysis was done by A. K. Nurmukhanbetova from National Laboratory Astana in Astana, Kazakhstan.

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