IAEA Technical Meeting on (alpha,n) nuclear data evaluation and data needs

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A new evaluation of 17O system (preliminary)

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A new evaluation of 170 system is made. The reaction channels includes: '160(N,N0)1600 ' '160(N,4HE)13C0 ' '160(N,N1)1601 ' '160(N,N2)1602 ' '160(N,N3)1603 ' '160(N,N4)1604 ' '160(N,4HE1)13C1 ' '160(N,4HE2)13C2 ' '160(N,4HE3)13C3 ' '13C(4HE,4HE)13C0 ' '13C(4HE,N0)1600 ' '13C(4HE,N1)1601 ' '13C(4HE,N2)1602 ' '13C(4HE,N3)1603 ' '13C(4HE,N4)1604 ' '13C(4HE,4HE)13C1 ' '13C(4HE,4HE)13C2 ' '13C(4HE,4HE)13C3',

and a reduced channel (used for 8 to 30 MeV), which represents the total contribution of other channels. The energy range of experimental data is 1e-7 to 30 MeV. The fitting looks good. A full set of integral cross section evaluation values are given, which includes (n, tot), (n,el), (n, inl), (n, n1), (n, n2), (n, n3), (n, n4), and (α , n), (α , n0), (α , n1), (α , n2), (α , n3). Special attention is paid to the impact of new data on the evaluation. Boromiza (2020)'s new data on (n, INL) play a positive role of constraint and obvious improvement, Gazeeva (2020)'s new data on (α , n0) (180 degrees) is acceptable. In deBoer's new data, (α , γ 6130) plays a positive role of constraint and significant improvement, and the differential cross section of (α , n0) plays a positive role of constraint and significant improvement. But, in Dr. deBoer's new data, the (α , γ 6050) and all other data on (α , n1) are difficult to use.

Theoretically, the ground state of 16O is 0+, the first excited state (6050) is 0-, and the second excited state (6130) is 1.5-. So for gamma transitions, 0- to 0+ is forbidden, 1.5- to 0+ is open. So, (n, n2) is much larger than (n, n1), as the evaluation values in ENDF/B7 and RAC2015, and (α ,n2) should be much larger than (α ,n1), the (α , γ 6130) should be larger than (α , γ 6050), However, in deBoer's data, it's just the other way around, the (α , γ 6050) is much larger than (α , γ 6130), which requires careful study of the reasons why.

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