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Memo CP-D/643

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To: Distribution
From: N. Otsuka, V. McLane
Subject: Light-nuclei reactions ($Z < 6$)

For neutron-induced reaction on light nuclei ($Z < 6$), all possible neutron reactions (SF1-SF4) are listed in **LEXFOR Light-Nuclei Reactions ($Z < 6$)**. Below are all possible SF1-SF4 combinations (SF3 \neq EL, INL etc.) for Lithium-6.

${}^6\text{Li}(n,\gamma){}^7\text{Li}$	3-LI-6 (N, G) 3-LI-7
${}^6\text{Li}(n,t+\alpha)$	3-LI-6 (N, T) 2-HE-4
${}^6\text{Li}(n,n+d+\alpha)$	3-LI-6 (N, N+D) 2-HE-4
${}^6\text{Li}(n,p){}^6\text{He}$	3-LI-6 (N, P) 2-HE-6
${}^6\text{Li}(n,2n+p+\alpha)$	3-LI-6 (N, 2N+P) 2-HE-4
${}^6\text{Li}(n,n+t+h)$	3-LI-6 (N, N+T) 2-HE-3

However, for those cases where there is an intermediate nucleus that is unstable and breaks up with the emission of a particle, and data is given that is dependent on that nucleus, we now allow the inclusion of the intermediate nucleus according to a conclusion of the 2010 NRDC meeting. The purpose of this memo is to clarify when the nucleus may be coded in SF4.

Example: 10688.002

This subentry gives angular distribution of deuteron in ${}^6\text{Li}(n,n+d+\alpha)$ where $n+\alpha$ is from the ground state of ${}^5\text{He}$. The REACTION is coded as:

REACTION (3-LI-6 (N, N+D) 2-HE-4, PAR, DA, D)

, with EN-SEC (E-LVL, 2-HE-5)

Under the new rules the coding is simplified to:

REACTION (3-LI-6 (N, D) 2-HE-5, PAR, DA)

We would propose to modify the last paragraph of this LEXFOR chapter under Neutron Reactions:

No REACTION codes other than those listed on the following pages should be used in EXFOR for the light-nuclei neutron-induced reactions, except when the branch code SEQ is given (see under **Outgoing Particles**). A further exception is made for intermediate nuclei that are unstable and break up with the emission of particle (*e.g.* n, p, α). In this case, if the data are given for only that portion of the reaction that proceeds through the intermediate nucleus, the intermediate nucleus is given as the product of the reaction.

Example: ${}^6\text{Li}(n,d){}^5\text{He}$ reaction where ${}^5\text{He}$ immediately decays to a neutron and an alpha particle, the reaction is coded, in general, as 3-LI-6(N,N+D)2-HE-4. However, where the experiment identified existence of ${}^5\text{He}$ (e.g. by outgoing neutron energy), the reaction should be coded as: 3-LI-6(N,D)2-HE-5.

In addition ~~to the processes listed~~, only scattering processes as well as sum cross sections, such as absorption, nonelastic, charged-particles emission, *etc.*, are defined for these nuclei.

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