

Two additions to LEXFOR “Isomeric flag”

(N. Otsuka, M. Mikhailiukova, 2016-03-16, Memo CP/D-896)

Addition to Memo CP-D/896 by N.O. (summary): The following new rules are proposed:

1. Assignment of an isomeric flag (e.g., G, M, M1, M2) based on the latest knowledge of decay and structure data (e.g., ENSDF) rather than author’s assignment.
2. Ordering of isomeric flags in REACTION SF4, e.g., 63-EU-152-G+M2 rather than 63-EU-152-M2+G.

1. Assignment of isomeric states

LEXFOR “Isomeric flag” mentions that *the assignment of isomeric states for a given nucleus may vary in the literature according to the growing knowledge of a particular nucleus* though it does not give any advice on selection of the isomeric flag to us.

A major example is ^{110}In for which it is now known that the 69 min state is ~60 keV higher than the 4.9 hr ground state. However the 69 min state is often treated as the ground state in the old literature. F. Tárkányi [1] gives the following remark in his report on $^{\text{nat}}\text{Cd}(p,x)^{110\text{m}}\text{In}$ and $^{110\text{g}}\text{In}$ excitation functions: *Here we have to notice that there is confusion in the literature regarding the ground and metastable state of this nucleus and we put Nortier’s, Kormali’s, Otozai’s and Skakun’s results on the proper category if it was necessary.*

Many EXFOR users do not check half-lives coded under DECAY-DATA when they select data sets from search results and plot them. If we always adopt the assignment by the authors for REACTION SF4 coding, it could be a source of confusions for EXFOR users. In order to avoid it, addition of the following addition to “Assignment of Isomeric States” of this LEXFOR entry is proposed:

The compiler should assign the isomer code based on the current knowledge of the structure and decay data while the decay data given by the authors must be kept.

Example

Now the 4.9 hr state of ^{110}In is known as the ground state to which isomeric transition from the 69 min metastable state is absent. When an article gives “ $^{110\text{m}}\text{In}$ (4.9 hr) production cross section”, 49-IN-110-G must be used in REACTION SF4 but the half-life reported in the article (4.9 hr) must be kept under DECAY-DATA.

2. Order of isomeric flags in algebraic sums in REACTION SF4

In order to standardize the order of isomeric flags appearing in their sums in REACTION SF4, the following addition is proposed.

Isomeric flags appearing in their sums should be sorted in order of G, M1, M2, e.g., -G+M1 instead of -M1+G.

Reference

[1] F. Tárkányi et al., Nucl. Instrum. Meth. B245 (2006) 379.

Existing codes affected by this new rule (REACTION, MONITOR, ASSUMED)

REACTION			Remark
22069.003	61-PM-148-M/M+G	-M/M+G -> -M/T	
22637.069	63-EU-152-M2+G	-M2+G => -G+M2	
22658.010	63-EU-152-M2+G	-M2+G => -G+M2	
22919.006	63-EU-152-M2/M2+G	-M2/M2+G > -M2/G+M2	
31411.005	77-IR-192-M1+G	-M1+G -> -G+M1	
31638.003	77-IR-192-M1+G	-M1+G -> -G+M1	
A0222.008	79-AU-196-M1+G	-M1+G -> -G+M1	
D4192.002	77-IR-192-M1+G	-M1+G -> -G+M1	
G4041.002	52-TE-123-M/M+G	-M/M+G -> -M/T	
O1267.005	67-HO-158-M1+G	-M1+G -> -G+M1	in PRELIM.O056

MONITOR			Remark
21571.001	79-AU-198-M+G	Delete -M+G.	
31511.001	27-CO-58-M+G	Delete -M+G.	
31515.001	27-CO-58-M+G	Delete -M+G.	