**Nuclear Data Section**

**International Atomic Energy Agency**

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**Memo CP-D/974**

**Date:** 15 March 2019

**To:** Distribution

**From:** N. Otsuka

**Subject: Fission yield ratios (isomeric ratio and fractional yield)**

**1. Isomeric ratios of fission product yield (SF6=FY/RAT and SIG/RAT)**

The isomeric ratio of the fission product yield can be coded with REACTION SF6=FY/RAT or SIG/RAT when it is for particle induced fission. I suggest to always use FY/RAT to improve the consistency. (FY/RAT can be used for spontaneous fission, too.). Addition of a sentence to LEXFOR “Ratios” is proposed.

**Isomeric Ratios**

Isomeric ratios are coded using the separator '/' in the isomer field of the reaction product (SF4), and with the modifier RAT in SF6. For isomeric ratios of the fission product yields, FY/RAT (not SIG/RAT) is used in SF6 (See **Isomeric States**.)

The following quantity code is proposed to implement this rule in some subentries submitted in PRELIM.2274.

**Dictionary 236 (Quantities)**

BIN/TER,FY/RAT Binary/ternary fission product yield ratio

|  |  |  |  |
| --- | --- | --- | --- |
| **Quantity** | **Reaction Type** | **Dimension** | **Subentry** |
| BIN/TER,FY/RAT | FY | NO | 21529.003, 005, 008, 01821822.002-004. |

**2. Fractional yield**

The fractional yield is the ratio of the cumulative/independent yield divided by the chain yield. Currently it is expressed by the REACTION ratio of the cumulative/independent yield to the chain yield, for example,

(92-U-235(N,F)56-BA-140,CUM,FY)/(92-U-235(N,F)MASS,CHN,FY)

for the fractional cumulative yield of 235U(n,f)140Ba. However, the EXFOR Formats Manual 6.8 mentions “Note that the reaction combination formalism is not used for certain frequently occurring sums, ratios”. I believe a specific quantity code must be introduced to the fractional yield so that users can access and extract fractional yields easier, and propose a new modifier FRC (fractional), with which the 140Ba cumulative yield can be expressed by

 (92-U-235(N,F)56-BA-140,CUM,FY,,FRC)

This can be easily extended to the ELEM/MASS formalism. It does not require coding of FRCUM or FRIND under RESULT anymore.

Revision of LEXFOR “Fission Yields” is proposed:

**Fractional Yields**

**…**

**REACTION coding**: ~~coded as an explicit ratio, and followed by the keyword result~~ FRC in SF8.

In all cases, the data are entered as ratios with values from 0 to 1 and data units NO-DIM.

***Examples***:

REACTION ((92-U-235(N,F)ELEM/MASS,IND,FY,,FRC)~~/~~

 ~~(92-U-235(N,F)MASS,CHN,FY))~~

~~RESULT (FRIND)~~

REACTION ((92-U-235(N,F)ELEM/MASS,CUM,FY,,FRC)~~/~~

 ~~(92-U-235(N,F)MASS,CHN,FY))~~

~~RESULT (FRCUM)~~

**Dictionary 34 (Modifiers)**

FRC Fractional

**Dictionary 37 (Results)**

FRCUM (Obsolete)

FRIND (Obsolete)

**Dictionary 236 (Quantities)**

CUM,FY,,FRC Fractional cumulative fission product yield

IND,FY,,FRC Fractional independent fission product yield

|  |  |  |
| --- | --- | --- |
| **Quantity** | **Reaction Type** | **Dimension** |
| CUM,FY/RAT | FY | NO |
| IND,FY/RAT | FY | NO |

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