Fission Yield Ratios (Isomeric Ratio and Fractional Yield)

(N. Otsuka, 2019-03-15, Memo CP-D/974)

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, 018 21822.002-004.

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 ^{235}U(n,f)^{140}Ba. 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 ^{140}Ba 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:

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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)
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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