**Nuclear Data Section**

**International Atomic Energy Agency**

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**Memo CP-D/966**

**Date:** 9 November 2018

**To:** Distribution

**From:** N. Otsuka

**Subject: EXFOR compilation statistics since last NRDC meeting**

This is EXFOR compilation statistics as of 7 November extracted from the Article Allocation List (<https://www-nds.iaea.org/nrdc/alloc/>).

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| --- | --- | --- | --- |
| **Centre** | **New entries transmitted**1 | **Revised entries transmitted**1 | **Articles not transmitted yet in EXFOR**2 |
| ATOMKI | **7** | 11 | 6 |
| CDFE | **10** | 58 | 4 |
| CJD | **2** | 141 | 12 |
| CNDC | **3** | 14 | 53 |
| CNPD | **19** | 87 | 24 |
| JCPRG | **12** | 0 | 172 |
| KNDC | **1** | 0 | 30 |
| NDPCI | **3** | 9 | 63 |
| NDS3 | **13** | 64 | 26 |
| NEADB | **35** | 62 | 382 |
| NNDC | **49** | 69 | 542 |
| UkrNDC | **0** | 15 | 39 |
| **Total** | **154** | **530** | **1353** |

1. Number of entries in finalized trans tapes transmitted after preparation of the full summary (WP2018-02) for the last NRDC meeting (2018-04-25). The date indicated in the TRANS record (N2) is used for this purpose. Accordingly, the following final TRANS tapes are within the scope of this statistics:

1439, 1440, 1441, 1442, 1443, 2266, 2267, 3183, 3184, 3185, 4178, 4179, A089, A090, B027, B028, C174, C175, C176, D116, D117, E115, E116, F068, G041, L035, L036, M095, M096, M097, O064, S024, V036

1. Number of articles excluding conference proceedings published within 5 years. (Conference: Articles registered with conference codes as well as EPJ/CS, JP/CS, NSTP, NSTS, AIP-, JAEA-C-)
2. Including articles compiled / to be compiled by the Almaty and Ulaanbaatar group.

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**Sums**

Sums of 2 or more reactions can be expressed as a reaction combination using the separator `+´ (see EXFOR Formats Manual Chapter 6).

~~For mathematical correctness, certain reaction combinations require that isotopic abundances be coded in SF8:~~

***~~Example~~***~~:~~

~~Two expressions of the~~ ~~47~~~~Sc production cross section by neutron irradiation of a natural titanium sample at the neutron energy where only~~ ~~47~~~~Ti and~~ ~~48~~~~Ti contribute (~~*~~a~~*~~: natural isotopic abundance):~~

~~REACTION ((22-TI-47(N,P)21-SC-47,,SIG,,A)+~~

~~(22-TI-48(N,X)21-SC-47,,SIG,,A))~~

*~~a~~*~~(~~~~47~~~~Ti) σ[~~~~47~~~~Ti(n,p)~~~~47~~~~Sc] +~~ *~~a~~*~~(~~~~48~~~~Ti) σ[~~~~48~~~~Ti(n,np+pn+d)~~ ~~47~~~~Sc] = σ[~~~~nat~~~~Ti(n,x)~~~~47~~~~Sc]~~

~~REACTION ((22-TI-47(N,P)21-SC-47,,SIG)+~~

~~(22-TI-48(N,X)21-SC-47,,SIG,,RAB))~~

~~σ[~~~~47~~~~Ti(n,p)~~~~47~~~~Sc] + [~~ *~~a~~*~~(~~~~48~~~~Ti) /~~ *~~a~~*~~(~~~~47~~~~Ti)] σ[~~~~48~~~~Ti(n,np+pn+d)~~ ~~47~~~~Sc] = σ[~~~~nat~~~~Ti(n,x)~~~~47~~~~Sc] /~~ *~~a~~*~~(~~~~47~~~~Ti)~~

**~~Sum Reactions~~**

Sum reactions such as absorption or nuclide production, where the individual competing reactions may not be known, are not coded using the form above.

**Production from Several Contributing Target Nuclides**

When several target nuclides of the element may contribute to formation of a product, the author may express it by a sum of isotopic cross sections. In the following examples,

* a(A) is the isotopic abundance of the target nuclide A,
* σ(A) is the isotopic cross section for the target nuclide A,
* σ(0) is the elemental cross section (*i.e.*, production cross section for a natural sample).

Summation is taken over the all energetically possible production channels:

1. **σ(0)=a(A)σ(A) + a(B)σ(B) +...**

This is nothing other than the elemental cross section, and should not be coded by the sum reactions.

***Example:***

(22-TI-0(N,X)21-SC-47,,SIG)

***Forbidden:***

((22-TI-47(N,P)21-SC-47,,SIG,,A)+(22-TI-48(N,X)21-SC-47,,SIG,,A))

1. **σ(0)/a(A)=σ(A) + [a(B)/a(A)]σ(B) + ...**

This is coded with a modifier RAB (multiplied by the natural isotopic abundance of the target nuclide divided by the natural isotopic abundance of the target nuclide of the first term). The isotopic abundance a(A) adopted by the author must be given under SAMPLE if known.

***Example:***

((22-TI-47(N,P)21-SC-47,,SIG)+(22-TI-48(N,X)21-SC-47,,SIG,,RAB))

1. **σ(0)/[a(A)+a(B)+...]=[a(A)σ(A) + b(B)σ(B) + ...] / [a(A) + a(B) + ...]**

This is coded with a general quantity modifier FCT with free text explanation about the multiplier. The isotopic abundances such a(A) and a(B) adopted by the author must be given under SAMPLE if known.

***Example:***

((22-TI-47(N,P)21-SC-47,,SIG,,FCT)+(22-TI-48(N,X)21-SC-47,,SIG,,FCT))

Elemental cross section divided by the sum of isotopic abundances of 47Ti and 48Ti.

**Sum of Unresolved Partial Quantities**

When the quantity is a sum of partial quantities whose secondary energies are unresolved (*e.g.,* due to detection resolution), it is coded as an inclusive reaction quantity (*i.e.*, SF3=X).

***Example:***

412 keV gamma production from n+natFe reaction originated from production of two unresolved gammas, 54Fe(n,n’)54Fe (411.5 keV) and 56Fe(n,2n)55Fe (411.7 keV), is coded by

(26-FE-0(N,X)0-G-0,PAR,SIG)

rather than

(26-FE-54(N,INL)26-FE-54,PAR,SIG,G,A)+(26-FE-56(N,2N)26-FE-55,PAR,SIG,G,A)

The contributing process is explained under EN-SEC.

***Example:***

EN-SEC (E,G) 411.5 keV gamma of 54Fe and 411.7 keV gamma of 55Fe, unresolved

**Reactions to Sums of Isomeric States**

Reactions to sums of isomeric states are coded using the separator "+" in the isomer field of the reaction product; see **Isomeric States**.

***Example***: (…(P,X)39-Y-102-M1+M2,,SIG)

***Note***: If the sum of all isomeric reactions is equal to the cross section for the given nuclide, it is coded without the isomer field.

***Example:*** (…(P,X)47-AG-109,,SIG)

***Forbidden:*** (…(P,X)47-AG-109-G+M,,SIG)