

# EXFOR News (June 2020)

## New experimental data available from Nuclear Reaction Data Centres

EXFOR [1] is a world-wide data library for experimental neutron, charged-particle and photon induced reaction data compiled by the [International Network of the Nuclear Reaction Data Centres \(NRDC\)](#)<sup>a</sup> coordinated by the [IAEA Nuclear Data Section](#). Regularly updated web retrieval databases are available at [IAEA-NDS](#) as well as [NNDC](#), [NEADB](#), [JCPRG](#) and [CDFE](#).

This News lists newly created EXFOR entries as well as revised EXFOR entries where new data subentries are added. Entries from articles published in past 10 years are flagged by asterisks (\*). Please send an email to the NRDC Coordinator ([n.otsuka@iaea.org](mailto:n.otsuka@iaea.org)) for inclusion in the EXFOR News distribution list as well as any question on EXFOR.

[1] N. Otuka, E. Dupont, V. Semkova, B. Pritychenko et al., [Nucl.Data.Sheets](#) **120**(2014)272.

### Quantity codes

ALF	$\alpha$ -value ( $\sigma_{\text{capt}}/\sigma_{\text{fis}}$ )	KE	Kinetic energy
AMP	Length or amplitude	INT	Cross section integral over incident energy
CHG	Fragment charge	KER	Kerma factor
CS	Cross section	MAS	Fragment mass
CSP	Partial cross section	MFQ	Differential fission neutron multiplicity
CST	Temperature dependent cross section	MLT	Multiplicity
D3A	Triple differential $d\Omega_1/d\Omega_2/dE'$	NQ	Nuclear quantity
D3E	Triple differential $d\Omega/dE'_1/dE'_2$	NU	Fission neutron multiplicity $\bar{\nu}$
D4A	Quadruple diff. $d\Omega_1/d\Omega_2/dE'_1/dE'_2$	NUD	Delayed fission neutron multiplicity $\bar{\nu}_d$
DA	Differential $d/d\Omega$	POL	Polarization
DAA	Double differential $d\Omega_1/d\Omega_2$	POD	Differential polarization
DAE	Double differential $d\Omega/dE'$	PY	Product yield (other than fission)
DAP	Partial differential $d/d\Omega$	RI	Resonance integral
DAT	Temperature-dependent Legendre coefficient	RP	Resonance parameter
DE	Differential $d/dE'$	RR	Reaction rate
DEP	Energy spectrum for specific group	SIF	Self indication
DP	Diff. by linear momentum of outgoing part.	SPC	Gamma spectrum
DT	Diff. by 4-momentum transfer squared	TSL	Thermal scattering
ETA	$\eta$ -value = $\bar{\nu}\sigma_{\text{fis}}/(\sigma_{\text{capt}} + \sigma_{\text{fis}})$	TT	Thick target yield
EVL	Evaluation	TTD	Differential thick target yield, $d/d\Omega$
FY	Fission product yield	TTP	Partial thick target yield

### Special codes in outgoing particle field

abs	Absorption	fus	Fusion	sct	Scattering	tot	Total
el	Elastic	inel	Inelastic	tex	Total charge changing		
fis	Fission	non	Nonelastic	ths	Thermal scattering		

### Special codes in incident energy field

Fast	Fast reactor spectrum average	Maxw	Maxwellian spectrum average
Fiss	Fission spectrum average	Spont	Spontaneous (for fission)

<sup>a</sup> [NNDC](#) (USA), [NEADB](#) (France), [NDS](#) (Austria), [CJD](#) (Russia), [CNDC](#) (China), [ATOMKI](#) (Hungary), [NDPCI](#) (India), [JAEA](#) (Japan), [JCPRG](#) (Japan), [KAERI](#) (Korea), [CDFE](#) (Russia), [CNPD](#) (Russia), [UkrNDC](#) (Ukraine)

**1 Hydrogen 1**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
* $^{41}\text{P}_{\text{inel}}$	$^1\text{H}$	?	1USAMSU	2.4+09	2.4+09	Jour	<a href="#">PR/C,100,044312</a>	19	L.A.Riley+	<a href="#">C2410</a>
* $^{43}\text{P}_{\text{inel}}$	$^1\text{H}$	?	1USAMSU	2.8+09	2.8+09	Jour	<a href="#">PR/C,100,044312</a>	19	L.A.Riley+	<a href="#">C2410</a>
* $^{42}\text{S}_{\text{inel}}$	$^1\text{H}$	?	1USAMSU	2.6+09	2.6+09	Jour	<a href="#">PR/C,100,044312</a>	19	L.A.Riley+	<a href="#">C2410</a>
* $^{44}\text{S}_{\text{inel}}$	$^1\text{H}$	?	1USAMSU	3.1+09	3.1+09	Jour	<a href="#">PR/C,100,044312</a>	19	L.A.Riley+	<a href="#">C2410</a>

**1 Hydrogen 2**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^{18}\text{F}_{p}$	$^{19}\text{F}$	?	2BLGLEU	1.4+06	1.4+06	Jour	<a href="#">NP/A,791,251</a>	07	N.Desereville+	<a href="#">O1515</a>
* $^{80}\text{Ge}_{p}$	$^{81}\text{Ge}$	?	1USAORL	3.1+08	3.1+08	Jour	<a href="#">PR/C,100,044613</a>	19	S.Ahn+	<a href="#">C2441</a>

**1 Hydrogen**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
* $n_{\text{tot}}$		CS	2JPNKTO	1.1-03	6.7+04	Jour	<a href="#">NST,57,1</a>	20	J.Lee+	<a href="#">23539</a>

**2 Helium 4**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$d_{\text{el}}$	$^4\text{He}$	CS	4RUSKUR	2.0+07	2.0+07	Jour	ZET,39,1612	60	K.P.Artemov+	<a href="#">F1401</a>
$d_{\text{el}}$	$^4\text{He}$	DA	4RUSKUR	2.0+07	2.0+07	Jour	ZET,39,1612	60	K.P.Artemov+	<a href="#">F1401</a>
$d,n+p$	$^4\text{He}$	CS	4RUSKUR	2.0+07	2.0+07	Jour	ZET,39,1612	60	K.P.Artemov+	<a href="#">F1401</a>
$d,n+p$	$^4\text{He}$	DA	4RUSKUR	2.0+07	2.0+07	Jour	ZET,39,1612	60	K.P.Artemov+	<a href="#">F1401</a>
$d,p$	$^5\text{He}$	DAP	4RUSKUR	2.0+07	2.0+07	Jour	ZET,39,1612	60	K.P.Artemov+	<a href="#">F1401</a>
$d,x+p$	inclusive	DAE	4RUSKUR	2.0+07	2.0+07	Jour	ZET,39,1612	60	K.P.Artemov+	<a href="#">F1401</a>

**3 Lithium 6**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$p_{\text{el}}$	$^6\text{Li}$	DA	1USACAL	5.0+05	2.9+06	Jour	<a href="#">PR,130,2034</a>	63	J.A.Mccray	<a href="#">A1410</a>
$t,^3\text{He}$	$^6\text{He}$	DAP	4RUSKUR	6.5+07	6.5+07	Jour	YF,46,385	87	D.V.Aleksandrov+	<a href="#">F1411</a>

**3                      Lithium                      7**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,α</i>	<sup>4</sup> He	POD	2JPNTSU	9.0+06	2.2+07	Jour	<a href="#">NIM/A,322,304</a>	92	Y.Tagishi+	F0082
<i>p,el</i>	<sup>7</sup> Li	DA	1USAFSU	6.9+06	6.9+06	Jour	<a href="#">NP/A,173,265</a>	71	H.G.Bingham+	A1431
<i>p,γ</i>	<sup>8</sup> Be	DAP	1USAMRY	4.2+05	4.6+05	Jour	<a href="#">NP,77,129</a>	66	J.B.Marion+	A1461
<i>t,α</i>	<sup>6</sup> He	DAP	4RUSKUR	3.1+07	3.1+07	Jour	YF,46,385	87	D.V.Aleksandrov+	F1411

**3                      Lithium                      8**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>α,n</i>	<sup>11</sup> B	CSP	2GRCATH	3.7+05	4.9+06	Jour	<a href="#">ZP/A,337,211</a>	90	T.Paradellis+	F0076

**4                      Beryllium                      9**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,d</i>	<sup>8</sup> Be	DAP	2UK MAN	5.7+06	5.7+06	Jour	<a href="#">PPS,77,65</a>	61	F.H.Read+	F0090
<i>p,el</i>	<sup>9</sup> Be	POD	1USAWIS	3.0+06	1.2+07	Jour	<a href="#">NP/A,148,236</a>	70	D.H.Loyd+	F0165
<i>p,γ</i>	<sup>10</sup> B	MLT	3HUNKOS	2.1+05	7.3+05	Jour	<a href="#">AHP,34,215</a>	73	S.Szegedi	F0109
<i>p,γ</i>	<sup>10</sup> B	?	3HUNKOS	3.3+05	5.5+05	Jour	<a href="#">AHP,34,215</a>	73	S.Szegedi	F0109
<i>p,n</i>	<sup>9</sup> B	DA	1USARIC	2.5+06	2.5+06	Jour	<a href="#">PR,100,91</a>	55	J.B.Marion+	F0126
<i>p,n</i>	<sup>9</sup> B	POD	1USALRL	7.1+06	1.1+07	Jour	<a href="#">PR,137,B1504</a>	65	B.D.Walker+	F0129
<i>d,n</i>	<sup>10</sup> B	DAP	1USAABD	1.4+07	1.6+07	Jour	<a href="#">PR/C,8,1557</a>	73	Y.S.Park+	F0110
* <i>56Ni,x</i>	<sup>55</sup> Co	CSP	1USAMSU	9.0+09	9.0+09	Jour	<a href="#">PR/C,99,051304</a>	19	M.Spieker+	C2401
* <i>56Ni,x</i>	<sup>55</sup> Ni	CSP	1USAMSU	9.0+09	9.0+09	Jour	<a href="#">PR/C,99,051304</a>	19	M.Spieker+	C2401

**5                      Boron                      10**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
* <i>α,n</i>	<sup>13</sup> N	DAP	1USANOT	1.6+06	4.9+06	Jour	<a href="#">PR/C,100,034601</a>	19	Q.Liu+	C2408

**5                      Boron                      11**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,n</i>	<sup>11</sup> C	DA	1USARIC	3.5+06	3.5+06	Jour	<a href="#">PR,100,91</a>	55	J.B.Marion+	F0126
<i>p,n</i>	<sup>11</sup> C	POD	1USALRL	7.1+06	1.1+07	Jour	<a href="#">PR,137,B1504</a>	65	B.D.Walker+	F0129
<i>d,n</i>	<sup>12</sup> C	POD	4RUSITE	9.3+06	9.3+06	Jour	ZET,46,1494	64	V.A.Smotryaev+	F1408
<i>d,p</i>	<sup>12</sup> B	CSP	3SAFWIT	1.0+06	4.2+06	Conf	62PADUA.,425	62	J.P.F.Sellschop+	F0014
<sup>3</sup> He,incl	<sup>11</sup> B	DAP	2UK HAR	1.8+07	4.0+07	Jour	<a href="#">NP/A,284,83</a>	77	M.A.M.Shahabuddin+	F0722

6 Carbon 12

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>d,n</i>	<sup>13</sup> N	POD	4RUSFTI	6.2+06	6.2+06	Jour	ZET,44,135	63	N.P.Babenko+	F1405
<sup>3</sup> He, $\alpha$	<sup>11</sup> C	DAP	4RUSKUR	2.6+07	3.3+07	Jour	ZET,45,910	63	V.M.Pankratov+	F1409
<sup>3</sup> He,el	<sup>12</sup> C	DA	4RUSKUR	2.6+07	3.8+07	Jour	ZET,44,887	63	V.M.Pankratov+	F1403
<sup>6</sup> Li, <i>d</i>	<sup>16</sup> O	CSP	4RUSKUR	2.6+07	2.6+07	Jour	IZV,33,566	69	V.D.Goldberg+	F1412
<sup>6</sup> Li, <i>d</i>	<sup>16</sup> O	DAP	4RUSKUR	2.5+07	2.6+07	Jour	IZV,33,566	69	V.D.Goldberg+	F1412
<sup>7</sup> Li, <i>t</i>	<sup>16</sup> O	CSP	4RUSKUR	2.8+07	3.0+07	Jour	IZV,33,566	69	V.D.Goldberg+	F1412
<sup>7</sup> Li, <i>t</i>	<sup>16</sup> O	DAP	4RUSKUR	2.8+07	3.0+07	Jour	IZV,33,566	69	V.D.Goldberg+	F1412
* <sup>7</sup> Li, <i>t</i>	<sup>16</sup> O	DAP	1USAFSU	3.4+07	3.4+07	Jour	PR/C,100,024604	19	W.D.Weintraub+	C2406

6 Carbon 13

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
* <i>n,<math>\gamma</math></i>	<sup>14</sup> C	CS	2FR ILL	2.5-02	2.5-02	Jour	EPJ/A,55,200	19	T.Wright+	23538
<i>p,n</i>	<sup>13</sup> N	DA	1USARIC	3.7+06	3.7+06	Jour	PR,100,91	55	J.B.Marion+	F0126

7 Nitrogen 14

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
* <i>p,el</i>		RP	4UZ UZB	-5.1+05	5.0+06	Jour	YF,75,320	12	S.V.Artemov+	A0945
* <i>p,el</i>	<sup>14</sup> N	DA	2FR GAN	4.9+05	1.1+06	Jour	PR/C,90,014307	14	I.Stefan+	O2232

7 Nitrogen 15

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
* <i>p,el</i>	<sup>15</sup> N	DA	2FR GAN	4.7+05	9.4+05	Jour	PR/C,90,014307	14	I.Stefan+	O2232

8 Oxygen 14

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
* <i>p,el</i>	<sup>14</sup> O	DA	2FR GAN	5.1+05	3.3+06	Jour	PR/C,90,014307	14	I.Stefan+	O2232

8 Oxygen 15

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
* <i>p,el</i>	<sup>15</sup> O	DA	2FR GAN	4.9+05	1.1+06	Jour	PR/C,90,014307	14	I.Stefan+	O2232

**8                    Oxygen                    16**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>d,t</i>	<sup>15</sup> O	DAP	4RUSKUR	2.0+07	2.0+07	Jour	IZV,25,115	61	N.A.Vlasov+	<a href="#">F1406</a>

**8                    Oxygen                    18**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>d,t</i>	<sup>17</sup> O	DAP	4RUSKUR	2.0+07	2.0+07	Jour	IZV,25,115	61	N.A.Vlasov+	<a href="#">F1406</a>

**9                    Fluorine                    19**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,n</i>	<sup>19</sup> Ne	DA	1USARIC	4.7+06	4.7+06	Jour	<a href="#">PR,100,91</a>	55	J.B.Marion+	<a href="#">F0126</a>

**10                    Neon                    22**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
*	$\alpha,\gamma$	RP	1USATNL	8.4+05	8.4+05	Jour	<a href="#">PR/C,99,045804</a>	19	S.Hunt+	<a href="#">C2399</a>

**11                    Sodium                    23**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<sup>3</sup> He,sct	<sup>23</sup> Na	DAP	4RUSKUR	2.6+07	3.3+07	Jour	ZET,44,887	63	V.M.Pankratov+	<a href="#">F1403</a>

**12                    Magnesium                    24**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>d,p</i>	<sup>25</sup> Mg	DAP	1USADKE	2.4+06	4.0+06	Jour	<a href="#">PR,105,1799</a>	57	S.A.Cox+	<a href="#">F0106</a>
<i>d,t</i>	<sup>23</sup> Mg	DAP	4RUSKUR	2.0+07	2.0+07	Jour	IZV,25,115	61	N.A.Vlasov+	<a href="#">F1406</a>
<sup>3</sup> He, $\alpha$	<sup>23</sup> Mg	DAP	4RUSKUR	2.7+07	3.3+07	Jour	ZET,45,910	63	V.M.Pankratov+	<a href="#">F1409</a>
<sup>3</sup> He,el	<sup>24</sup> Mg	DA	4RUSKUR	2.6+07	3.3+07	Jour	ZET,44,887	63	V.M.Pankratov+	<a href="#">F1403</a>

**12                    Magnesium                    25**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					

<i>d,t</i>	<sup>24</sup> Mg	DAP	4RUSKUR	2.0+07	2.0+07	Jour	IZV,25,115	61	N.A.Vlasov+	<a href="#">F1406</a>
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**12 Magnesium 26**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>d,t</i>	<sup>25</sup> Mg	DAP	4RUSKUR	2.0+07	2.0+07	Jour	IZV,25,115	61	N.A.Vlasov+	<a href="#">F1406</a>

**13 Aluminium 27**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,n</i>	<sup>27</sup> Si	CS	4RUSFEI	2.2+07	2.2+07	Jour	YF,31,561	80	N.S.Biryukov+	<a href="#">A0068</a>
<sup>3</sup> He,el	<sup>27</sup> Al	DA	4RUSKUR	2.6+07	3.3+07	Jour	ZET,44,887	63	V.M.Pankratov+	<a href="#">F1403</a>

**19 Potassium 41**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,α</i>	<sup>38</sup> Ar	RR	3AULAML			Jour	<a href="#">NP/A,454,128</a>	86	M.E.Sevior+	<a href="#">A0392</a>
<i>p,γ</i>	<sup>42</sup> Ca	RR	3AULAML			Jour	<a href="#">NP/A,454,128</a>	86	M.E.Sevior+	<a href="#">A0392</a>
<i>p,n</i>	<sup>41</sup> Ca	RR	3AULAML			Jour	<a href="#">NP/A,454,128</a>	86	M.E.Sevior+	<a href="#">A0392</a>

**24 Chromium 52**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,x</i>	<sup>52</sup> Mn	CS	4RUSFEI	2.2+07	2.2+07	Jour	YF,31,561	80	N.S.Biryukov+	<a href="#">A0068</a>

**26 Iron 56**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,x</i>	<sup>56</sup> Co	CS	4RUSFEI	2.2+07	2.2+07	Jour	YF,31,561	80	N.S.Biryukov+	<a href="#">A0068</a>

**27 Cobalt 59**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,el</i>	<sup>59</sup> Co	DA	4RUSMOS	5.8+06	6.4+06	Jour	IZV,38,133	74	V.B.Gubin+	<a href="#">F1407</a>

**28                  Nickel                  58**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #
				Min	Max					
<i>p,el</i>	<sup>58</sup> Ni	DA	4RUSMOS	5.8+06	6.3+06	Jour	IZV,38,133	74	V.B.Gubin+	<a href="#">F1407</a>
<i>p,inel</i>	<sup>58</sup> Ni	DAP	4RUSMOS	6.0+06	6.5+06	Jour	IZV,38,133	74	V.B.Gubin+	<a href="#">F1407</a>
<i>p,n</i>	<sup>58</sup> Cu	CS	4RUSFEI	2.2+07	2.2+07	Jour	YF,31,561	80	N.S.Biryukov+	<a href="#">A0068</a>
* <i><sup>10</sup>C,el</i>	<sup>58</sup> Ni	DA	1USANOT	3.5+07	3.5+07	Jour	<a href="#">PR/C,100,034603</a>	19	V.Guimaraes+	<a href="#">C2409</a>

**28                  Nickel                  60**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #
				Min	Max					
<i>p,el</i>	<sup>60</sup> Ni	DA	4RUSMOS	5.8+06	6.3+06	Jour	IZV,38,133	74	V.B.Gubin+	<a href="#">F1407</a>
<i>p,inel</i>	<sup>60</sup> Ni	DAP	4RUSMOS	5.8+06	6.4+06	Jour	IZV,38,133	74	V.B.Gubin+	<a href="#">F1407</a>
<i>p,x</i>	<sup>60</sup> Cu	CS	4RUSFEI	2.2+07	2.2+07	Jour	YF,31,561	80	N.S.Biryukov+	<a href="#">A0068</a>

**28                  Nickel                  62**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #
				Min	Max					
<i>p,el</i>	<sup>62</sup> Ni	DA	4RUSMOS	6.0+06	6.3+06	Jour	IZV,38,133	74	V.B.Gubin+	<a href="#">F1407</a>

**28                  Nickel                  64**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #
				Min	Max					
<i>p,el</i>	<sup>64</sup> Ni	DA	4RUSMOS	5.9+06	6.3+06	Jour	IZV,38,133	74	V.B.Gubin+	<a href="#">F1407</a>

**40                  Zirconium                  90**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #
				Min	Max					
<i>p,x</i>	<sup>90</sup> Nb	CS	4RUSFEI	2.2+07	2.2+07	Jour	YF,31,561	80	N.S.Biryukov+	<a href="#">A0068</a>
<i>α,el</i>	<sup>90</sup> Zr	DA	4KASKAZ	5.0+07	5.0+07	Jour	YF,66,627	03	A.D.Duysebaev+	<a href="#">F0561</a>
<i>α,inel</i>	<sup>90</sup> Zr	DAP	4KASKAZ	5.0+07	5.0+07	Jour	YF,66,627	03	A.D.Duysebaev+	<a href="#">F0561</a>

**40                  Zirconium                  91**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #
				Min	Max					
<i>p,x</i>	<sup>91</sup> Nb	CS	4RUSFEI	2.2+07	2.2+07	Jour	YF,31,561	80	N.S.Biryukov+	<a href="#">A0068</a>

**40                      Zirconium                      94**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #
				Min	Max					
<i>p,x</i>	<sup>94</sup> Nb	CS	4RUSFEI	2.2+07	2.2+07	Jour	YF,31,561	80	N.S.Biryukov+	A0068
$\alpha$ ,el	<sup>94</sup> Zr	DA	4KASKAZ	5.0+07	5.0+07	Jour	YF,66,627	03	A.D.Duysebaev+	F0561
$\alpha$ ,inel	<sup>94</sup> Zr	DAP	4KASKAZ	5.0+07	5.0+07	Jour	YF,66,627	03	A.D.Duysebaev+	F0561

**42                      Molybdenum                      92**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #	
				Min	Max						
*	<i>p,<math>\gamma</math></i>	<sup>93</sup> Tc	CS	1USANOT	1.1+07	1.8+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413
*	<i>p,n</i>	<sup>92</sup> Tc	CS	1USANOT	1.1+07	1.8+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413
*	<i>p,x</i>	<sup>89</sup> Nb	CS	1USANOT	1.1+07	1.8+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413
*	<i>p,x</i>	<sup>91</sup> Nb	CS	1USANOT	1.3+07	1.8+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413
*	<i>p,x</i>	<sup>91</sup> Mo	CS	1USANOT	1.6+07	1.8+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413

**42                      Molybdenum                      94**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #	
				Min	Max						
*	<i>p,2n</i>	<sup>93</sup> Tc	CS	1USANOT	1.4+07	1.9+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413
*	<i>p,n</i>	<sup>94</sup> Tc	CS	1USANOT	9.0+06	1.9+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413
*	<i>p,x</i>	<sup>91</sup> Nb	CS	1USANOT	1.0+07	1.9+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413
*	<i>p,x</i>	<sup>93</sup> Mo	CS	1USANOT	1.6+07	1.9+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413
*	<i>p,x</i>	<sup>94</sup> Tc	CS	1USANOT	9.0+06	1.9+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413

**42                      Molybdenum                      95**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #	
				Min	Max						
*	<i>p,2n</i>	<sup>94</sup> Tc	CS	1USANOT	1.3+07	1.9+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413
*	<i>p,n</i>	<sup>95</sup> Tc	CS	1USANOT	1.1+07	1.9+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413
*	<i>p,x</i>	<sup>91</sup> Nb	CS	1USANOT	1.3+07	1.9+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413
*	<i>p,x</i>	<sup>92</sup> Nb	CS	1USANOT	1.1+07	1.9+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413

**42                      Molybdenum                      96**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #	
				Min	Max						
*	<i>p,2n</i>	<sup>95</sup> Tc	CS	1USANOT	1.2+07	1.9+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413
*	<i>p,n</i>	<sup>96</sup> Tc	CS	1USANOT	8.0+06	1.9+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413
*	<i>p,x</i>	<sup>92</sup> Nb	CS	1USANOT	1.4+07	1.9+07	Jour	PR/C,100,034614	19	E.Lamere+	C2413



**42 Molybdenum 97**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
* <i>p,2n</i>	<sup>96</sup> Tc	CS	1USANOT	1.1+07	1.5+07	Jour	<a href="#">PR/C,100,034614</a>	19	E.Lamere+	<a href="#">C2413</a>
* <i>p,n</i>	<sup>97</sup> Tc	CS	1USANOT	9.0+06	1.5+07	Jour	<a href="#">PR/C,100,034614</a>	19	E.Lamere+	<a href="#">C2413</a>

**42 Molybdenum 98**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
* <i>p,2n</i>	<sup>97</sup> Tc	CS	1USANOT	1.0+07	1.9+07	Jour	<a href="#">PR/C,100,034614</a>	19	E.Lamere+	<a href="#">C2413</a>
* <i>p,γ</i>	<sup>99</sup> Tc	CS	1USANOT	1.0+07	1.9+07	Jour	<a href="#">PR/C,100,034614</a>	19	E.Lamere+	<a href="#">C2413</a>
* <i>p,x</i>	<sup>95</sup> Nb	CS	1USANOT	1.0+07	1.9+07	Jour	<a href="#">PR/C,100,034614</a>	19	E.Lamere+	<a href="#">C2413</a>

**42 Molybdenum 100**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
* <i>p,2n</i>	<sup>99</sup> Tc	CS	1USANOT	8.0+06	1.9+07	Jour	<a href="#">PR/C,100,034614</a>	19	E.Lamere+	<a href="#">C2413</a>
* <i>p,γ</i>	<sup>101</sup> Tc	CS	1USANOT	8.0+06	1.9+07	Jour	<a href="#">PR/C,100,034614</a>	19	E.Lamere+	<a href="#">C2413</a>
* <i>p,x</i>	<sup>96</sup> Nb	CS	1USANOT	1.4+07	1.9+07	Jour	<a href="#">PR/C,100,034614</a>	19	E.Lamere+	<a href="#">C2413</a>
* <i>p,x</i>	<sup>97</sup> Nb	CS	1USANOT	8.0+06	1.9+07	Jour	<a href="#">PR/C,100,034614</a>	19	E.Lamere+	<a href="#">C2413</a>
* <i>p,x</i>	<sup>99</sup> Mo	CS	1USANOT	8.0+06	1.9+07	Jour	<a href="#">PR/C,100,034614</a>	19	E.Lamere+	<a href="#">C2413</a>

**47 Silver**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
* <i>n,tot</i>		CS	2ZZZGEL	4.0-01	1.2+02	Rept	INDC(EUR)-0036	20	L.Salamon+	<a href="#">23533</a>

**49 Indium 115**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,x</i>	<sup>115</sup> Sn	CS	4RUSFEI	2.2+07	2.2+07	Jour	YF,31,561	80	N.S.Biryukov+	<a href="#">A0068</a>

**69 Thulium 171**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
* <i>n,γ</i>	<sup>172</sup> Tm	CS	2GERMNZ	2.5-02	2.5-02	Jour	<a href="#">PR/C,99,065810</a>	19	T.Heftrich+	<a href="#">23540</a>
* <i>n,γ</i>	<sup>172</sup> Tm	RI	2GERMNZ	9.0-02	2.0+06	Jour	<a href="#">PR/C,99,065810</a>	19	T.Heftrich+	<a href="#">23540</a>

73 Tantalum 181

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,x</i>	<sup>181</sup> W	CS	4RUSFEI	2.2+07	2.2+07	Jour	YF,31,561	80	N.S.Biryukov+	A0068
<sup>3</sup> He,fis		CS	1USACLU	2.5+07	4.4+07	Jour	<a href="#">PR/C,28,1217</a>	83	F.D.Becchetti+	<a href="#">C2442</a>
<sup>3</sup> He,fis		DA	1USACLU	4.4+07	4.4+07	Jour	<a href="#">PR/C,28,1217</a>	83	F.D.Becchetti+	<a href="#">C2442</a>

74 Tungsten 182

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha$ ,fis		CS	1USAWWS	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>
$\alpha$ ,fis	<sup>93</sup> Y	CS	1USAWAU	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>

74 Tungsten 183

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha$ ,fis		CS	1USAWWS	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>
$\alpha$ ,fis	<sup>93</sup> Y	CS	1USAWAU	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>

74 Tungsten 184

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha$ ,fis		CS	1USAWWS	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>
$\alpha$ ,fis	<sup>93</sup> Y	CS	1USAWAU	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>

74 Tungsten 186

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha$ ,fis		CS	1USAWWS	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>
$\alpha$ ,fis	<sup>93</sup> Y	CS	1USAWAU	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>

75 Rhenium

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<sup>3</sup> He,fis		DA	1USACLU	4.4+07	4.4+07	Jour	<a href="#">PR/C,28,1217</a>	83	F.D.Becchetti+	<a href="#">C2442</a>

## 77 Iridium 193

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
* $n,2n$	$^{192}\text{Ir}$	CS	2GRCATH	1.0+07	2.1+07	Jour	<a href="#">EPJ/A,55,187</a>	19	A.Kalamara+	<a href="#">23537</a>

## 78 Platinum 194

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha$ ,fis	Many	CS	1USAWAU	3.4+07	3.4+07	Jour	<a href="#">JIN,27,1463</a>	65	E.F.Neuzil+	<a href="#">C2431</a>
$\alpha$ ,fis		CS	1USAWAU	3.4+07	4.1+07	Jour	<a href="#">JIN,27,1463</a>	65	E.F.Neuzil+	<a href="#">C2431</a>
$\alpha$ ,fis	Many	CS	1USAWAU	4.1+07	4.1+07	Jour	<a href="#">JIN,27,1463</a>	65	E.F.Neuzil+	<a href="#">C2431</a>

## 78 Platinum 195

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha$ ,fis	Many	CS	1USAWAU	3.4+07	3.4+07	Jour	<a href="#">JIN,27,1463</a>	65	E.F.Neuzil+	<a href="#">C2431</a>
$\alpha$ ,fis		CS	1USAWAU	3.4+07	4.1+07	Jour	<a href="#">JIN,27,1463</a>	65	E.F.Neuzil+	<a href="#">C2431</a>
$\alpha$ ,fis	Many	CS	1USAWAU	4.1+07	4.1+07	Jour	<a href="#">JIN,27,1463</a>	65	E.F.Neuzil+	<a href="#">C2431</a>

## 78 Platinum 196

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha$ ,fis	Many	CS	1USAWAU	3.4+07	3.4+07	Jour	<a href="#">JIN,27,1463</a>	65	E.F.Neuzil+	<a href="#">C2431</a>
$\alpha$ ,fis		CS	1USAWAU	3.4+07	4.1+07	Jour	<a href="#">JIN,27,1463</a>	65	E.F.Neuzil+	<a href="#">C2431</a>
$\alpha$ ,fis	Many	CS	1USAWAU	4.1+07	4.1+07	Jour	<a href="#">JIN,27,1463</a>	65	E.F.Neuzil+	<a href="#">C2431</a>

## 79 Gold 197

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$p$ ,fis		CS	1USABRK	2.2+08	3.4+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	<a href="#">C2444</a>
$p$ ,fis	Many	CS	1USABRK	3.2+07	3.2+07	Jour	<a href="#">JIN,31,1571</a>	69	E.F.Neuzil+	<a href="#">C2427</a>
$p$ ,fis		CS	1USABRK	3.2+07	3.2+07	Jour	<a href="#">JIN,31,1571</a>	69	E.F.Neuzil+	<a href="#">C2427</a>
$d$ ,fis		CS	1USABRK	1.1+08	1.9+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	<a href="#">C2444</a>
$^3\text{He}$ ,fis		CS	1USACLU	2.0+07	4.4+07	Jour	<a href="#">PR/C,28,1217</a>	83	F.D.Becchetti+	<a href="#">C2442</a>
$^3\text{He}$ ,fis		DA	1USACLU	4.4+07	4.4+07	Jour	<a href="#">PR/C,28,1217</a>	83	F.D.Becchetti+	<a href="#">C2442</a>
$\alpha$ ,fis		CS	1USABRK	5.6+07	3.9+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	<a href="#">C2444</a>

## 80 Mercury 198

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					

$\alpha$ ,fis	Many	CS	IUSAWAU	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>
$\alpha$ ,fis		CS	IUSAWWS	4.1+07	6.5+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>
$\alpha$ ,fis	Many	CS	IUSABRK	6.5+07	6.5+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>

**80                      Mercury                      199**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha$ ,fis	Many	CS	IUSAWAU	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>
$\alpha$ ,fis		CS	IUSAWWS	4.1+07	6.5+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>
$\alpha$ ,fis	Many	CS	IUSABRK	6.5+07	6.5+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>

**80                      Mercury                      200**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha$ ,fis	Many	CS	IUSAWAU	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>
$\alpha$ ,fis		CS	IUSAWWS	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>

**80                      Mercury                      201**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha$ ,fis	Many	CS	IUSAWAU	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>
$\alpha$ ,fis		CS	IUSAWWS	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>

**80                      Mercury                      202**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha$ ,fis	Many	CS	IUSAWAU	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>
$\alpha$ ,fis		CS	IUSAWWS	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>

**80                      Mercury                      204**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha$ ,fis	Many	CS	IUSAWAU	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>
$\alpha$ ,fis		CS	IUSAWWS	4.1+07	4.1+07	Jour	<a href="#">JIN,38,2153</a>	76	E.F.Neuzil	<a href="#">C2433</a>

**81                      Thallium                      205**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,n</i>	<sup>205</sup> Pb	CS	4UKRKFT	1.9+07	1.9+07	Jour	ZET,39,1620	60	V.L.Glagolev+	F1402

**83                      Bismuth                      209**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,fis</i>		CS	1USABRK	2.2+08	3.4+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	C2444
* <i>p,fis</i>	Many	CS	4ZZZDUB	6.6+08	6.6+08	Jour	<a href="#">PR/C,100,024616</a>	19	A.R.Balabekyan+	F1410
<i>d,fis</i>		CS	1USABRK	3.8+07	1.9+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	C2444
<sup>3</sup> He, <i>fis</i>		CS	1USACLU	1.9+07	4.4+07	Jour	<a href="#">PR/C,28,1217</a>	83	F.D.Becchetti+	C2442
<sup>3</sup> He, <i>fis</i>		DA	1USACLU	4.4+07	4.4+07	Jour	<a href="#">PR/C,28,1217</a>	83	F.D.Becchetti+	C2442
<i>α,fis</i>		CS	1USABRK	5.6+07	3.9+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	C2444
<i>α,fis</i>	<sup>115</sup> Cd	CS	1USAWAU	3.5+07	3.5+07	Jour	<a href="#">PR/C,4,2282</a>	71	W.D.Loveland+	C2446

**88                      Radium                      225**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>d,fis</i>	<sup>115</sup> Cd	CS	1USAWAU	1.9+07	1.9+07	Jour	<a href="#">PR/C,4,2282</a>	71	W.D.Loveland+	C2446
<i>d,fis</i>	<sup>134</sup> Cs	CS	1USAWAU	1.9+07	1.9+07	Jour	<a href="#">PR/C,4,2282</a>	71	W.D.Loveland+	C2446

**88                      Radium                      226**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,fis</i>	Many	FY	1USAORL	9.0+06	1.3+07	Jour	<a href="#">NP/A,139,513</a>	69	E.Konecny+	C2428
<i>p,fis</i>	Many	?	1USAORL	9.0+06	1.3+07	Jour	<a href="#">NP/A,139,513</a>	69	E.Konecny+	C2428
<i>α,4n</i>	<sup>226</sup> Th	CS	1USABRK	3.6+07	4.6+07	Jour	<a href="#">PR,111,1358</a>	58	R.Vandenbosch+	A0480

**90                      Thorium                      230**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>α,4n</i>	<sup>230</sup> U	CS	1USABRK	3.8+07	4.4+07	Jour	<a href="#">PR,111,1358</a>	58	R.Vandenbosch+	A0480

**90                      Thorium                      232**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,fis</i>		CS	1USABRK	2.2+08	3.4+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	C2444
<i>p,fis</i>	<sup>4</sup> He	FY	1USAWAU	1.0+07	1.0+07	Jour	<a href="#">PR,133,B724</a>	64	J.A.Coleman+	C2452
<i>p,x</i>	Many	PY	1USALAS	8.0+08	8.0+08	Jour	<a href="#">NSE,99,41</a>	88	J.S.Gilmore+	C2430

<i>p,x</i>	Many	?	1USALAS	8.0+08	8.0+08	Jour	<a href="#">NSE,99,41</a>	88	J.S.Gilmore+	<a href="#">C2430</a>
<i>d,fis</i>		CS	1USABRK	7.1+06	1.9+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	<a href="#">C2444</a>
<i>d,fis</i>	<sup>115</sup> Cd	CS	1USAWAU	2.0+07	2.0+07	Jour	<a href="#">PR/C,4,2282</a>	71	W.D.Loveland+	<a href="#">C2446</a>
<i>d,fis</i>	<sup>134</sup> Cs	CS	1USAWAU	2.0+07	2.0+07	Jour	<a href="#">PR/C,4,2282</a>	71	W.D.Loveland+	<a href="#">C2446</a>
<sup>3</sup> He,fis		CS	1USACLU	2.0+07	4.4+07	Jour	<a href="#">PR/C,28,1217</a>	83	F.D.Becchetti+	<a href="#">C2442</a>
<sup>3</sup> He,fis		DA	1USACLU	4.4+07	4.4+07	Jour	<a href="#">PR/C,28,1217</a>	83	F.D.Becchetti+	<a href="#">C2442</a>
$\alpha$ ,fis		CS	1USABRK	1.6+07	3.9+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	<a href="#">C2444</a>
$\alpha$ ,fis	<sup>4</sup> He	FY	1USAWAU	3.0+07	4.2+07	Jour	<a href="#">PR,133,B724</a>	64	J.A.Coleman+	<a href="#">C2452</a>
<sup>22</sup> Ne,x	Many	DA	4ZZZDUB	1.2+08	1.5+08	Jour	ZET,44,798	63	H.Kumpf+	<a href="#">F1404</a>
<sup>22</sup> Ne,x	<sup>224</sup> Ra	CS	4ZZZDUB	1.3+08	1.4+08	Jour	ZET,44,798	63	H.Kumpf+	<a href="#">F1404</a>
<sup>22</sup> Ne,x	<sup>225</sup> Ac	CS	4ZZZDUB	1.1+08	1.5+08	Jour	ZET,44,798	63	H.Kumpf+	<a href="#">F1404</a>
<sup>22</sup> Ne,x	<sup>226</sup> Ac	CS	4ZZZDUB	1.1+08	1.5+08	Jour	ZET,44,798	63	H.Kumpf+	<a href="#">F1404</a>

**92 Uranium 233**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha$ ,fis	Many	CS	1USABRK	2.4+07	4.6+07	Jour	<a href="#">PR,111,1358</a>	58	R.Vandenbosch+	<a href="#">A0480</a>

**92 Uranium 235**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #	
				Min	Max						
*	<i>n,fis</i>	$\gamma$	FY	2FR ILL	5.0-03	5.0-03	Jour	<a href="#">PR/C,100,044610</a>	19	H.Makii+	<a href="#">23541</a>
*	<i>n,fis</i>	Many	FY	2FR ILL	5.0-03	5.0-03	Jour	<a href="#">PR/C,100,044610</a>	19	H.Makii+	<a href="#">23541</a>
*	<i>n,fis</i>	$\gamma$	FY	2FR ILL	5.0-03	5.0-03	Jour	<a href="#">PR/C,100,044610</a>	19	H.Makii+	<a href="#">23541</a>
*	<i>n,fis</i>	$\gamma$	KE	2FR ILL	5.0-03	5.0-03	Jour	<a href="#">PR/C,100,044610</a>	19	H.Makii+	<a href="#">23541</a>
	<i>p,fis</i>		CS	1USABRK	2.2+08	3.4+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	<a href="#">C2444</a>
	<i>p,fis</i>	<sup>90</sup> Y	CS	1CANMCG	2.0+07	8.5+07	Jour	<a href="#">CJC,48,1924</a>	70	A.H.Khan+	<a href="#">O0594</a>
	<i>p,fis</i>	<sup>91</sup> Y	CS	1CANMCG	2.0+07	8.5+07	Jour	<a href="#">CJC,48,1924</a>	70	A.H.Khan+	<a href="#">O0594</a>
	<i>p,fis</i>	<sup>95</sup> Nb	CS	1USAWAU	1.0+07	1.0+07	Jour	<a href="#">JIN,30,365</a>	68	C.Rudy+	<a href="#">C2425</a>
	<i>d,fis</i>		CS	1USABRK	7.6+06	1.9+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	<a href="#">C2444</a>
	<i>d,p+fis</i>	Many	FY	1USAORL	1.3+07	1.3+07	Jour	<a href="#">PL/B,31,526</a>	70	R.L.Ferguson+	<a href="#">C2429</a>
	<i>d,p+fis</i>	Many	?	1USAORL	1.3+07	1.3+07	Jour	<a href="#">PL/B,31,526</a>	70	R.L.Ferguson+	<a href="#">C2429</a>
	$\alpha$ ,fis		CS	1USABRK	1.8+07	3.9+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	<a href="#">C2444</a>
	$\alpha$ ,fis	Many	CS	1USABRK	1.9+07	4.6+07	Jour	<a href="#">PR,111,1358</a>	58	R.Vandenbosch+	<a href="#">A0480</a>
	$\alpha$ ,fis		CS	1USABRK	2.0+07	3.9+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	<a href="#">C2444</a>
	$\alpha$ ,fis	Many	FY	1USABRK	2.4+07	4.6+07	Rept	UCRL-8926	59	Y.Y.Chu	<a href="#">C2426</a>
	$\alpha$ ,fis	Many	?	1USABRK	2.4+07	4.6+07	Rept	UCRL-8926	59	Y.Y.Chu	<a href="#">C2426</a>

**92 Uranium 236**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha$ , <i>4n</i>	<sup>236</sup> Pu	CS	1USABRK	3.4+07	4.6+07	Jour	<a href="#">PR,111,1358</a>	58	R.Vandenbosch+	<a href="#">A0480</a>

**92 Uranium 238**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p</i> ,fis		CS	1USABRK	2.2+08	3.4+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	<a href="#">C2444</a>
<i>p</i> ,fis	Many	?	1USABRK	7.3+08	7.3+08	Rept	UCRL-8926	59	Y.Y.Chu	<a href="#">C2426</a>
<i>p</i> ,fis	<sup>4</sup> He	FY	1USAWAU	1.0+07	1.0+07	Jour	<a href="#">PR,133,B724</a>	64	J.A.Coleman+	<a href="#">C2452</a>
<i>p</i> ,fis	<sup>90</sup> Y	CS	1CANMCG	2.0+07	8.5+07	Jour	<a href="#">CJC,48,1924</a>	70	A.H.Khan+	<a href="#">O0594</a>
<i>p</i> ,fis	<sup>91</sup> Y	CS	1CANMCG	2.0+07	8.5+07	Jour	<a href="#">CJC,48,1924</a>	70	A.H.Khan+	<a href="#">O0594</a>
<i>p</i> , $\gamma$	<sup>239</sup> Np	PY	1USALAS	8.0+08	8.0+08	Jour	<a href="#">NSE,99,41</a>	88	J.S.Gilmore+	<a href="#">C2430</a>
<i>p</i> ,x	Many	PY	1USALAS	8.0+08	8.0+08	Jour	<a href="#">NSE,99,41</a>	88	J.S.Gilmore+	<a href="#">C2430</a>
<i>p</i> ,x	Many	?	1USALAS	8.0+08	8.0+08	Jour	<a href="#">NSE,99,41</a>	88	J.S.Gilmore+	<a href="#">C2430</a>
<i>d</i> ,fis		CS	1USABRK	6.7+06	1.9+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	<a href="#">C2444</a>
<sup>3</sup> He, $\alpha$ +fis		CS	1USAINU	1.3+08	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
<sup>3</sup> He, $\alpha$ +fis		DA	1USAINU	1.3+08	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
<sup>3</sup> He, $\alpha$ +fis		DAE	1USAINU	2.7+08	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
<sup>3</sup> He, <i>d</i> +fis		CS	1USAINU	6.3+07	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
<sup>3</sup> He, <i>d</i> +fis		DA	1USAINU	6.3+07	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
<sup>3</sup> He, <i>d</i> +fis		DAE	1USAINU	2.7+08	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
<sup>3</sup> He,fis	Many	CS	1USAAANL		1.4+07	Jour	<a href="#">JIN,33,2745</a>	71	E.F.Meyerjr+	<a href="#">C2432</a>
<sup>3</sup> He,fis		CS	1USAAANL	1.4+07	3.0+07	Jour	<a href="#">JIN,33,2745</a>	71	E.F.Meyerjr+	<a href="#">C2432</a>
<sup>3</sup> He,fis	Many	CS	1USAAANL	2.1+07	3.0+07	Jour	<a href="#">JIN,33,2745</a>	71	E.F.Meyerjr+	<a href="#">C2432</a>
<sup>3</sup> He,fis	Many	CS	1USAAANL	3.1+07	3.1+07	Jour	<a href="#">PR,182,1303</a>	69	K.W.Macmurdo+	<a href="#">C2434</a>
<sup>3</sup> He,fis		CS	1USAAANL	3.1+07	3.1+07	Jour	<a href="#">PR,182,1303</a>	69	K.W.Macmurdo+	<a href="#">C2434</a>
<sup>3</sup> He,fis	Many	NU	1USAAANL	3.1+07	3.1+07	Jour	<a href="#">PR,182,1303</a>	69	K.W.Macmurdo+	<a href="#">C2434</a>
<sup>3</sup> He,inel+fis		CS	1USAINU	1.3+08	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
<sup>3</sup> He,inel+fis		DA	1USAINU	1.3+08	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
<sup>3</sup> He,inel+fis		DAE	1USAINU	2.7+08	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
<sup>3</sup> He, <i>p</i> +fis		CS	1USAINU	6.3+07	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
<sup>3</sup> He, <i>p</i> +fis		DA	1USAINU	6.3+07	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
<sup>3</sup> He, <i>p</i> +fis		DAE	1USAINU	2.7+08	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
<sup>3</sup> He, <i>t</i> +fis		CS	1USAINU	6.3+07	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
<sup>3</sup> He, <i>t</i> +fis		DA	1USAINU	6.3+07	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
<sup>3</sup> He, <i>t</i> +fis		DAE	1USAINU	2.7+08	2.7+08	Jour	<a href="#">PR/C,40,1279</a>	89	W.Skulski+	<a href="#">C2443</a>
$\alpha$ ,fis		CS	1USABRK	1.8+07	3.9+08	Jour	<a href="#">PR,79,632</a>	50	J.Jungerman	<a href="#">C2444</a>
$\alpha$ ,fis	Many	CS	1USABRK	2.3+07	4.5+07	Jour	<a href="#">PR,111,1358</a>	58	R.Vandenbosch+	<a href="#">A0480</a>
$\alpha$ ,fis	Many	FY	1USABRK	2.4+07	4.6+07	Rept	UCRL-8926	59	Y.Y.Chu	<a href="#">C2426</a>
$\alpha$ ,fis	Many	?	1USABRK	2.4+07	4.6+07	Rept	UCRL-8926	59	Y.Y.Chu	<a href="#">C2426</a>
$\alpha$ ,fis	<sup>4</sup> He	FY	1USAWAU	3.0+07	4.2+07	Jour	<a href="#">PR,133,B724</a>	64	J.A.Coleman+	<a href="#">C2452</a>
$\alpha$ ,fis	<sup>115</sup> Cd	CS	1USAWAU	3.5+07	3.5+07	Jour	<a href="#">PR/C,4,2282</a>	71	W.D.Loveland+	<a href="#">C2446</a>
$\alpha$ ,fis	<sup>134</sup> Cs	CS	1USAWAU	3.5+07	3.5+07	Jour	<a href="#">PR/C,4,2282</a>	71	W.D.Loveland+	<a href="#">C2446</a>
<sup>12</sup> C,fis	Many	?	1USABRK	1.0+08	1.0+08	Rept	UCRL-8926	59	Y.Y.Chu	<a href="#">C2426</a>

**93 Neptunium 237**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>d</i> ,2 <i>n</i>	<sup>237</sup> Pu	CS	1USABRK	1.4+07	2.3+07	Jour	<a href="#">PR,111,1358</a>	58	R.Vandenbosch+	<a href="#">A0480</a>
<i>d</i> ,3 <i>n</i>	<sup>236</sup> Pu	CS	1USABRK	1.4+07	2.3+07	Jour	<a href="#">PR,111,1358</a>	58	R.Vandenbosch+	<a href="#">A0480</a>
<i>d</i> , <i>p</i>	<sup>238</sup> Np	CS	1USABRK	8.6+06	2.3+07	Jour	<a href="#">PR,111,1358</a>	58	R.Vandenbosch+	<a href="#">A0480</a>

**94            Plutonium            239**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,2n</i>	<sup>238</sup> Am	?	1USALAS	1.3+07	1.5+07	Jour	<a href="#">PR/C,6,1090</a>	72	H.C.Britt+	<a href="#">C2435</a>

**94            Plutonium            240**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,2n</i>	<sup>239</sup> Am	?	1USALAS	1.2+07	1.6+07	Jour	<a href="#">PR/C,6,1090</a>	72	H.C.Britt+	<a href="#">C2435</a>
<i>p,2n+fis</i>	Many	FY	1USAORL	1.3+07	1.3+07	Jour	<a href="#">PL/B,31,526</a>	70	R.L.Ferguson+	<a href="#">C2429</a>
<i>p,2n+fis</i>	Many	?	1USAORL	1.3+07	1.3+07	Jour	<a href="#">PL/B,31,526</a>	70	R.L.Ferguson+	<a href="#">C2429</a>
<i>d,fis</i>		KE	1USALAS	7.6+06	1.4+07	Jour	<a href="#">NP/A,108,689</a>	68	B.H.Erkkila+	<a href="#">C2445</a>
<i>t,2n</i>	<sup>241</sup> Am	?	1USALAS	1.0+07	1.6+07	Jour	<a href="#">PR/C,6,1090</a>	72	H.C.Britt+	<a href="#">C2435</a>

**94            Plutonium            241**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<sup>3</sup> He, $\alpha$ +fis		KE	1USAANL	3.4+07	3.4+07	Jour	<a href="#">PR/C,20,1819</a>	79	B.B.Back+	<a href="#">C2436</a>
<sup>3</sup> He, $\alpha$ +fis	Many	KE	1USAANL	3.4+07	3.4+07	Jour	<a href="#">PR/C,20,1819</a>	79	B.B.Back+	<a href="#">C2436</a>
<sup>3</sup> He, $\alpha$ +fis	Many	?	1USAANL	3.4+07	3.4+07	Jour	<a href="#">PR/C,20,1819</a>	79	B.B.Back+	<a href="#">C2436</a>

**94            Plutonium            242**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,2n</i>	<sup>241</sup> Am	?	1USALAS	1.0+07	1.5+07	Jour	<a href="#">PR/C,6,1090</a>	72	H.C.Britt+	<a href="#">C2435</a>
<i>t,2n</i>	<sup>243</sup> Am	?	1USALAS	1.1+07	1.6+07	Jour	<a href="#">PR/C,6,1090</a>	72	H.C.Britt+	<a href="#">C2435</a>

**94            Plutonium            244**

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,2n</i>	<sup>243</sup> Am	?	1USALAS	9.0+06	1.4+07	Jour	<a href="#">PR/C,6,1090</a>	72	H.C.Britt+	<a href="#">C2435</a>
<i>t,2n</i>	<sup>245</sup> Am	?	1USALAS	1.2+07	2.0+07	Jour	<a href="#">PR/C,6,1090</a>	72	H.C.Britt+	<a href="#">C2435</a>