

## Japan Charged-Particle Nuclear Reaction Data Group (JCPRG)

### EXFOR : Recent Compilation List (Added in Oct 2005)

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Retrieval service is available at:

<http://www.jcprg.org/exfor/>

#### Quantity code

ALF	Alpha	FY	Fission product yield
AMP	Length or amplitude	INT	Cross section integral over incident energy
CHG	Fragment charge	KE	Kinetic energy
CS	Cross section	KER	Kerma factor
CSN	Differential with respect to number of particles	MLT	Multiplicity
CSP	Partial cross section	NQ	Nuclear quantity
CST	Temperature dependent cross section	NU	Nu
D3A	Triple differential $d\Omega_1/d\Omega_2/dE'$	NUD	Nu delayed
D3E	Triple differential $d\Omega/dE'_1/dE'_2$	NUF	Fragment neutrons
D4A	Quadruple diff. $d\Omega_1/d\Omega_2/dE'_1/dE'_2$	POL	Polarization
DA	Differential $d/d\Omega$	POD	Differential polarization
DAA	Double differential $d\Omega_1/d\Omega_2$	PY	Product yield (other than fission)
DAE	Double differential $d\Omega/dE'$	RI	Resonance integral
DAP	Partial differential $d/d\Omega$	RP	Resonance parameter
DAT	Temperature-dependent Legendre coefficient	RR	Reaction rate
DE	Differential $d/dE'$	SIF	Self indication
DEP	Energy spectrum for specific group	SPC	Gamma spectrum
DP	Diff. by linear momentum of outgoing part.	TSL	Thermal scattering
DT	Diff. by 4-momentum transfer squared	TT	Thick target yield
ETA	Eta	TTD	Differential thick target yield, $d/d\Omega$
EVL	Evaluation	TT	Partial thick target yield

#### Special codes in outgoing particle field

abs	Absorption	fus	Fusion	non	Nonelastic	ths	Thermal scattering
el	Elastic	inel	Inelastic	sct	Scattering	tot	Total
f	Fission	incl	Inclusive	tcc	Total charge changing		

#### Special codes in incident energy field

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



3

Lithium

7

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,d</i>	<sup>6</sup> Li	DAP	1USALAS	8.0+08		Jour	PR/C,21,757	80	T.S.Bauer+	C1296
<i>p,γ</i>	<sup>8</sup> Be	CSP	1USACSM	0.0+00		Jour	NP/A,539,75	92	F.E.Cecil+	C1290

4

Beryllium

9

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,γ</i>	<sup>10</sup> B	CSP	1USACSM	0.0+00		Jour	NP/A,539,75	92	F.E.Cecil+	C1290
<i>p,n</i>	<sup>9</sup> B	DAE	1USALAS	8.0+08		Jour	CJP,65,637	87	D.A.Lind	C1297
<sup>6</sup> Li,abs		CS	2JPNIPC	2.3+08		Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>6</sup> Li,non		CS	2JPNIPC	2.3+08		Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>7</sup> Be,abs		CS	2JPNIPC	2.2+08	3.5+08	Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>7</sup> Be,non		CS	2JPNIPC	2.2+08	3.5+08	Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>7</sup> Be, <i>p</i> +X	<sup>6</sup> Li	CS	2JPNIPC	2.2+08		Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>10</sup> Be, <sup>9</sup> Be	<sup>10</sup> Be	DAP	1USATAM	1.0+08		Jour	NP/A,631,788	98	A.M.Mukhamedzhanov+	C1335
<sup>8</sup> B,abs		CS	2JPNIPC	3.0+08	4.8+08	Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>8</sup> B,non		CS	2JPNIPC	3.0+08	4.8+08	Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>8</sup> B, <i>p</i> +X	<sup>7</sup> Be	CS	2JPNIPC	3.0+08	4.8+08	Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>11</sup> B,non		CS	1CANLUQ	1.4+06	4.4+06	Jour	NP/A,427,186	84	B.Dasmahapatra+	C1289
<sup>19</sup> C,x	<sup>17</sup> C	CS	2JPNIPC	1.2+09		Jour	NP/A,741,29	Sep 04	M.Chiba+	E1906
<sup>19</sup> C,x	<sup>17</sup> C	DP	2JPNIPC	1.2+09		Jour	NP/A,741,29	Sep 04	M.Chiba+	E1906
<sup>19</sup> C,x	<sup>18</sup> C	CS	2JPNIPC	1.2+09		Jour	NP/A,741,29	Sep 04	M.Chiba+	E1906
<sup>19</sup> C,x	<sup>18</sup> C	DP	2JPNIPC	1.2+09		Jour	NP/A,741,29	Sep 04	M.Chiba+	E1906
<sup>15</sup> O,x	<sup>13</sup> C	CS	2JPNIPC	8.4+08		Jour	NP/A,739,(1-2),57	Jul 04	H.Jeppesen+	E1902
<sup>15</sup> O,x	<sup>13</sup> C	DP	2JPNIPC	8.4+08		Jour	NP/A,739,(1-2),57	Jul 04	H.Jeppesen+	E1902
<sup>15</sup> O,x	<sup>14</sup> N	CS	2JPNIPC	8.4+08		Jour	NP/A,739,(1-2),57	Jul 04	H.Jeppesen+	E1902
<sup>15</sup> O,x	<sup>14</sup> N	DP	2JPNIPC	8.4+08		Jour	NP/A,739,(1-2),57	Jul 04	H.Jeppesen+	E1902

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Boron

10

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,el</i>	<sup>10</sup> B	DA	1USAINU	2.0+08		Jour	PR/C,71,064607	05	A.C.Betker+	C1291
<i>p,el</i>	<sup>10</sup> B	POD	1USAINU	2.0+08		Jour	PR/C,71,064607	05	A.C.Betker+	C1291
<i>p,inel</i>	<sup>10</sup> B	DAP	1USAINU	2.0+08		Jour	PR/C,71,064607	05	A.C.Betker+	C1291
<i>p,inel</i>	<sup>10</sup> B	DAP	1USAINU	2.0+08		Jour	PRL,69,2054	92	H.Baghaei+	C1327
<i>p,inel</i>	<sup>10</sup> B	POD	1USAINU	2.0+08		Jour	PR/C,71,064607	05	A.C.Betker+	C1291
<i>p,inel</i>	<sup>10</sup> B	POD	1USAINU	2.0+08		Jour	PRL,69,2054	92	H.Baghaei+	C1327

5

Boron

11

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,γ</i>	<sup>12</sup> C	CSP	1USACSM	0.0+00		Jour	NP/A,539,75	92	F.E.Cecil+	C1290
<i>p,γ</i>	<sup>12</sup> C	DAP	1USACSM	1.6+05		Jour	NP/A,539,75	92	F.E.Cecil+	C1290
<i>p,inel</i>	<sup>11</sup> B	DAP	2JPNOSA	3.9+08		Jour	PR/C,70,(3),034318	Sep 04	T.Kawabata+	E1912





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## Magnesium

26

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,el</i>	<sup>26</sup> Mg	DA	1USAMSU	4.0+07		Jour	PR/C,28,542	83	B.Zwieglinski+	C1286
<i>p,inel</i>	<sup>26</sup> Mg	DAP	1USAMSU	4.0+07		Jour	PR/C,28,542	83	B.Zwieglinski+	C1286
<sup>3</sup> He, <i>d</i>	<sup>27</sup> Al	DAP	1USAPTN	2.0+07		Jour	NP/A,512,317	90	A.E.Champagne+	C1322
<sup>3</sup> He, <i>d</i>	<sup>27</sup> Al	DAP	1USAPTN	2.0+07		Jour	NP/A,499,546	89	T.F.Wang+	C1324

## 13

## Aluminium

27

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,el</i>	<sup>27</sup> Al	DA	1USABRK	1.3+07	2.5+07	Jour	NP/A,411,1	83	R.Roy+	C1332
<i>p,el</i>	<sup>27</sup> Al	POD	1USABRK	1.3+07	2.5+07	Jour	NP/A,411,1	83	R.Roy+	C1332
<i>p,n</i>	<sup>27</sup> Si	DAE	1USALAS	8.0+08		Jour	CJP,65,637	87	D.A.Lind	C1297
<sup>6</sup> Li,abs		CS	2JPNIPC	2.3+08		Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>6</sup> Li,non		CS	2JPNIPC	2.3+08		Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>7</sup> Be,abs		CS	2JPNIPC	2.2+08	3.5+08	Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>7</sup> Be,non		CS	2JPNIPC	2.2+08	3.5+08	Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>7</sup> Be, <i>p</i> +X	<sup>6</sup> Li	CS	2JPNIPC	2.2+08		Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>8</sup> B,abs		CS	2JPNIPC	3.0+08	4.7+08	Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>8</sup> B,non		CS	2JPNIPC	3.0+08	4.7+08	Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903
<sup>8</sup> B, <i>p</i> +X	<sup>7</sup> Be	CS	2JPNIPC	3.0+08	4.7+08	Jour	NP/A,656,(2),209	Aug 99	M.Fukuda+	E1903

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## Silicon

28

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<sup>3</sup> He, $\alpha$	<sup>27</sup> Si	DAP	1USAPTN	2.2+07		Jour	NP/A,499,546	89	T.F.Wang+	C1324

## 14

## Silicon

29

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<sup>3</sup> He, $\alpha$	<sup>28</sup> Si	DAP	1CANLUQ	1.4+07		Jour	CJP,63,951	85	L.Potvin+	C1288

## 14

## Silicon

30

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<sup>3</sup> He, <i>d</i>	<sup>31</sup> P	DA	1USABRK	3.3+07		Jour	NP/A,436,125	85	J.D.Brown+	C1331
<sup>3</sup> He, <i>d</i>	<sup>31</sup> P	POD	1USABRK	3.3+07		Jour	NP/A,436,125	85	J.D.Brown+	C1331
<sup>3</sup> He, <i>el</i>	<sup>30</sup> Si	DA	1USABRK	3.3+07		Jour	NP/A,436,125	85	J.D.Brown+	C1331
<sup>3</sup> He, <i>el</i>	<sup>30</sup> Si	POD	1USABRK	3.3+07		Jour	NP/A,436,125	85	J.D.Brown+	C1331

**15                      Phosphorus                      31**

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>d,el</i>	<sup>31</sup> P	POD	1USABRK	3.5+07		Jour	NP/A,436,125	85	J.D.Brown+	C1331
<i>d,<sup>3</sup>He</i>	<sup>30</sup> Si	DA	1USABRK	3.3+07		Jour	NP/A,436,125	85	J.D.Brown+	C1331
<i>d,<sup>3</sup>He</i>	<sup>30</sup> Si	POD	1USABRK	3.3+07		Jour	NP/A,436,125	85	J.D.Brown+	C1331

**16                      Sulphur                      32**

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,el</i>	<sup>32</sup> S	DA	1USABRK	1.5+07	2.5+07	Jour	NP/A,411,1	83	R.Roy+	C1332
<i>p,el</i>	<sup>32</sup> S	POD	1USABRK	1.5+07	2.5+07	Jour	NP/A,411,1	83	R.Roy+	C1332

**18                      Argon                      40**

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,el</i>	<sup>40</sup> Ar	POD	1USABRK	2.5+07	4.1+07	Jour	NP/A,393,45	83	N.T.Okumusoglu+	C1329

**19                      Potassium                      41**

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>α,2n</i>	<sup>43</sup> Sc	CS	1USABNL	2.4+07	4.0+07	Jour	CJC,39,697	61	T.Matsuo+	C1280
<i>α,n</i>	<sup>44</sup> Sc	CS	1USABNL	1.6+07	4.0+07	Jour	CJC,39,697	61	T.Matsuo+	C1280

**20                      Calcium                      40**

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,inel</i>	<sup>40</sup> Ca	DAP	1USALAS	3.3+08		Jour	PR/C,30,709	84	D.J.Horen+	C1295
<i>p,inel</i>	<sup>40</sup> Ca	POD	1USALAS	3.3+08		Jour	PR/C,30,709	84	D.J.Horen+	C1295

**20                      Calcium                      48**

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,γ</i>		RP	2JPNTIT	2.0+06		Jour	JPJ,35,(2),325	Aug 73	M.Adachi+	E0149
<i>p,γ</i>	<sup>49</sup> Sc	SPC	2JPNTIT	1.9+06	2.0+06	Jour	JPJ,35,(2),325	Aug 73	M.Adachi+	E0149
<i>p,n</i>	<sup>48</sup> Sc	SPC	2JPNTIT	1.9+06	2.0+06	Jour	JPJ,35,(2),325	Aug 73	M.Adachi+	E0149

<b>23 Vanadium 51</b>										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha, d$	$^{53}\text{Cr}$	DAP	2JPNOSA	2.2+07		Jour	JPJ,36,(4),929	Apr 74	J.Kawa+	E0105
<b>24 Chromium 53</b>										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^3\text{He}, \alpha$	$^{52}\text{Cr}$	DAP	1CANLUQ	1.4+07		Jour	CJP,63,951	85	L.Potvin+	C1288
<b>26 Iron 56</b>										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^{12}\text{C}, \text{el}$	$^{nat}\text{Fe}$	DA	1USABRK	1.2+08		Rept	UCRL-9650,	61	J.Alster	C1330
<b>26 Iron 56</b>										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$p, \text{inel}$	$^{56}\text{Fe}$	DAP	1USAPTN	1.8+07		Jour	BAP,8,367	63	N.R.Roberson+	C1326
<b>26 Iron 58</b>										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$p, \text{inel}$	$^{58}\text{Fe}$	DAP	1USAPTN	1.8+07		Jour	BAP,8,367	63	N.R.Roberson+	C1326
<b>27 Cobalt 59</b>										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$t, p$	$^{61}\text{Co}$	DAP	1USAPEN	1.5+07		Jour	PR/C,31,392	85	H.T.Fortune+	C1307
$t, p$	$^{61}\text{Co}$	DAP	1USAPEN	1.5+07		Jour	NP/A,406,291	83	D.L.Watson+	C1308
<b>28 Nickel</b>										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$p, n$		DA	1USACOL	1.6+06	6.0+06	Jour	RSI,28,56	57	K.W.Jones+	C1298
$d, n$		DA	1USACOL	1.1+06	5.3+06	Jour	RSI,28,56	57	K.W.Jones+	C1298
$^{12}\text{C}, \text{el}$	$^{nat}\text{Ni}$	DA	1USABRK	1.2+08		Rept	UCRL-9650,	61	J.Alster	C1330

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## Nickel

58

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,el</i>	<sup>58</sup> Ni	DA	1USALAS	3.3+08	8.0+08	Jour	PR/C,37,692	88	N.M.Hintz+	C1292
<i>p,inel</i>	<sup>58</sup> Ni	DAP	1USAPTN	1.8+07		Jour	BAP,9,93	64	N.R.Roberson+	C1318
<i>p,inel</i>	<sup>58</sup> Ni	DAP	1USALAS	3.3+08	5.0+08	Jour	PR/C,37,692	88	N.M.Hintz+	C1292
<sup>6</sup> Li, <i>el</i>	<sup>58</sup> Ni	DA	1USAMSU	7.4+07		Jour	PR/C,22,1522	80	R.Huffman+	C1287

## 28

## Nickel

60

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,inel</i>	<sup>60</sup> Ni	DAP	1USAPTN	1.8+07		Jour	BAP,9,93	64	N.R.Roberson+	C1318

## 28

## Nickel

62

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,inel</i>	<sup>62</sup> Ni	DAP	1USAPTN	1.8+07		Jour	BAP,9,93	64	N.R.Roberson+	C1318

## 29

## Copper

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,n</i>		DAE	1USALAS	8.0+08		Jour	CJP,65,637	87	D.A.Lind	C1297

## 32

## Germanium

73

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>t,p</i>	<sup>75</sup> Ge	DAP	1USAPEN	1.5+07		Jour	PR/C,36,959	87	H.T.Fortune+	C1303

## 34

## Selenium

76

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>t,p</i>	<sup>78</sup> Se	DAP	1USAPEN	1.7+07		Jour	PR/C,35,430	87	D.L.Watson+	C1305

34 Selenium 78										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>t,p</i>	<sup>80</sup> Se	DAP	1USAPEN	1.7+07		Jour	PR/C,34,1592	86	M.Burlein+	C1306
34 Selenium 80										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>t,α</i>	<sup>79</sup> As	DAP	1USAPEN	1.8+07		Jour	PR/C,28,623	83	S.Mordechai+	C1309
34 Selenium 82										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>t,α</i>	<sup>81</sup> As	DAP	1USAPEN	1.8+07		Jour	PR/C,25,1276	82	S.Mordechai+	C1310
<i>t,p</i>	<sup>84</sup> Se	DAP	1USAPEN	1.7+07		Jour	PR/C,37,587	88	S.M.Mullinsand+	C1300
38 Strontium 87										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>d,<sup>3</sup>He</i>	<sup>86</sup> Rb	DAP	1USAPTN	2.8+07		Jour	NP/A,469,393	87	P.C.Li+	C1325
38 Strontium 88										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>d,<sup>3</sup>He</i>	<sup>87</sup> Rb	DAP	1USAPTN	2.8+07		Jour	NP/A,469,393	87	P.C.Li+	C1325
39 Yttrium 89										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,2n</i>	<sup>88</sup> Zr	CS	1USAROC	6.0+07	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,3n</i>	<sup>87</sup> Zr	CS	1USAROC	1.0+08	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,4n</i>	<sup>86</sup> Zr	CS	1USAROC	6.0+07	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,n</i>	<sup>89</sup> Zr	CS	1USAROC	6.0+07	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,tot</i>		CS	1USAROC	6.0+07	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>72</sup> As	CS	1USAROC	1.0+08	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>74</sup> As	CS	1USAROC	1.0+08	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>72</sup> Se	CS	1USAROC	1.0+08	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>73</sup> Se	CS	1USAROC	1.0+08	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>75</sup> Br	CS	1USAROC	1.5+08	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>76</sup> Br	CS	1USAROC	1.5+08	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299

<i>p,x</i>	<sup>77</sup> Br	CS	1USAROC	1.5+08	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>80</sup> Br	CS	1USAROC	6.0+07	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>82</sup> Rb	CS	1USAROC	1.0+08	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>84</sup> Rb	CS	1USAROC	6.0+07	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>86</sup> Rb	CS	1USAROC	1.0+08	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>82</sup> Sr	CS	1USAROC	1.0+08	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>83</sup> Sr	CS	1USAROC	6.0+07	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>87</sup> Sr	CS	1USAROC	6.0+07	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>82</sup> Y	CS	1USAROC	1.5+08	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>85</sup> Y	CS	1USAROC	1.8+08	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>87</sup> Y	CS	1USAROC	6.0+07	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>87</sup> Y	?	1USAROC	6.0+07	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299
<i>p,x</i>	<sup>88</sup> Y	CS	1USAROC	6.0+07	2.4+08	Jour	PR,115,1238	59	A.A.Caretto+	C1299

**40**

**Zirconium**

**90**

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,el</i>	<sup>90</sup> Zr	DA	1USALAS	8.0+08		Jour	PR/C,28,294	83	M.M.Gazzaly+	C1294
<i>p,inel</i>	<sup>90</sup> Zr	DAP	1USALAS	8.0+08		Jour	PR/C,28,294	83	M.M.Gazzaly+	C1294
<i>p,n</i>	<sup>90</sup> Nb	DAE	2JPNOSA	3.0+08		Jour	JPJ,73,(7),1611	Jul 04	T.Wakasa+	E1909
<i>p,n</i>	<sup>90</sup> Nb	POD	2JPNOSA	3.0+08		Jour	JPJ,73,(7),1611	Jul 04	T.Wakasa+	E1909
<sup>6</sup> Li, <i>el</i>	<sup>90</sup> Zr	DA	1USAMSU	7.4+07		Jour	PR/C,22,1522	80	R.Huffman+	C1287

**42**

**Molybdenum**

**96**

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,d</i>	<sup>95</sup> Mo	DAE	2JPNOSA	5.0+07		Jour	PR/C,70,(3),034612	Sep 04	S.A.Sultana+	E1913
<i>p,d</i>	<sup>95</sup> Mo	DAP	2JPNOSA	5.0+07		Jour	PR/C,70,(3),034612	Sep 04	S.A.Sultana+	E1913
<i>p,d</i>	<sup>95</sup> Mo	POD	2JPNOSA	5.0+07		Jour	PR/C,70,(3),034612	Sep 04	S.A.Sultana+	E1913

**42**

**Molybdenum**

**97**

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>t,α</i>	<sup>96</sup> Nb	DAP	1USALAS	1.7+07		Jour	PR/C,29,657	84	P.F.Cloessner+	C1441

**47**

**Silver**

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<sup>3</sup> He, <i>p</i>	incl	DAE	1USAINU	2.0+08		Jour	PR/C,44,582	91	F.Zhu+	C1442

48

Cadmium

110

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$t,p$	$^{112}\text{Cd}$	DAP	1USAPEN	1.5+07		Jour	PR/C,36,1785	87	L.R.Medsker+	C1302

48

Cadmium

114

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$t,p$	$^{116}\text{Cd}$	DAP	1USAPEN	1.5+07		Jour	JP/G,13,1443	87	D.L.Watson+	C1301

49

Indium

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$p,n$		DAE	1USALAS	8.0+08		Jour	CJP,65,637	87	D.A.Lind	C1297

50

Tin

124

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^6\text{Li},e\ell$	$^{124}\text{Sn}$	DA	1USAMSU	7.4+07		Jour	PR/C,22,1522	80	R.Huffman+	C1287

59

Praesodymium

141

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^{40}\text{Ar},x$	Many	CS	2JPNIPC	2.6+08	3.7+09	Jour	RCA,69,(2),65	95	H.Kusawake+	E1910

60

Neodymium

144

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$d,^6\text{Li}$	$^{140}\text{Ce}$	DAP	1USAMSU	3.3+07		Jour	BAP,24,667	79	D.Overway+	C1314

62

Samarium

144

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^3\text{He},t$	$^{144}\text{Eu}$	DA	1USAMSU	4.6+07		Jour	NP/A,402,262	83	J.Janecke+	C1311

				62		Samarium		146			
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max	Ref Vol Page					
$p,t$	$^{144}\text{Sm}$	DAP	1USALAS	2.5+07		Jour	PR/C,28,97		83	E.R.Flynn+	C1293

				62		Samarium		147			
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max	Ref Vol Page					
$^3\text{He},t$	$^{147}\text{Eu}$	DA	1USAMSU	4.6+07		Jour	NP/A,402,262		83	J.Janecke+	C1311

				62		Samarium		148			
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max	Ref Vol Page					
$d,^6\text{Li}$	$^{144}\text{Nd}$	DAP	1USAMSU	3.5+07		Jour	NP/A,276,72		77	F.L.Milder+	C1312
$^3\text{He},t$	$^{148}\text{Eu}$	DA	1USAMSU	4.6+07		Jour	NP/A,402,262		83	J.Janecke+	C1311

				62		Samarium		149			
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max	Ref Vol Page					
$^3\text{He},t$	$^{149}\text{Eu}$	DA	1USAMSU	4.6+07		Jour	NP/A,402,262		83	J.Janecke+	C1311

				62		Samarium		150			
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max	Ref Vol Page					
$^3\text{He},t$	$^{150}\text{Eu}$	DA	1USAMSU	4.6+07		Jour	NP/A,402,262		83	J.Janecke+	C1311

				62		Samarium		152			
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max	Ref Vol Page					
$^3\text{He},t$	$^{152}\text{Eu}$	DA	1USAMSU	4.6+07		Jour	NP/A,402,262		83	J.Janecke+	C1311

				62		Samarium		154			
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max	Ref Vol Page					
$^3\text{He},t$	$^{154}\text{Eu}$	DA	1USAMSU	4.6+07		Jour	NP/A,402,262		83	J.Janecke+	C1311

<b>64 Gadolinium 148</b>										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,t</i>	<sup>146</sup> Gd	DAP	1USALAS	2.5+07		Jour	PR/C,28,97	83	E.R.Flynn+	C1293
<b>68 Erbium 166</b>										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>d,<sup>6</sup>Li</i>	<sup>162</sup> Dy	DAP	1USAMCU	3.5+07		Jour	NP/A,276,72	77	F.L.Milder+	C1312
<b>70 Ytterbium 176</b>										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>t,p</i>	<sup>178</sup> Yb	DAP	1USAPEN	1.5+07		Jour	PR/C,26,965	82	J.D.Zumbro+	C1304
<b>77 Iridium 193</b>										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>d,t</i>	<sup>192</sup> Ir	DAP	1CANMCM	1.8+07		Conf	93FRIBOU,,236	93	P.E.Garrett+	C1339
<b>79 Gold 197</b>										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,<math>\gamma</math></i>	<sup>198</sup> Hg	DAE	1USAWAU	3.4+07		Conf	99SANTA,,152	99	S.J.Luke+	C1284
<b>82 Lead 206</b>										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,n</i>		DAE	1USALAS	8.0+08		Jour	CJP,65,637	87	D.A.Lind	C1297
<sup>11</sup> Be,inel	<i>nat</i> Pb	CSP	2JPNIPC	7.6+08		Jour	PR/C,70,(5),054606	Nov 04	N.Fukuda+	E1915
<sup>11</sup> Be,inel	<i>nat</i> Pb	DAE	2JPNIPC	7.6+08		Jour	PR/C,70,(5),054606	Nov 04	N.Fukuda+	E1915
<sup>11</sup> Be,inel	<i>nat</i> Pb	DAP	2JPNIPC	7.6+08		Jour	PR/C,70,(5),054606	Nov 04	N.Fukuda+	E1915
<b>82 Lead 206</b>										
Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					



$^{16}\text{O},6n$   $^{248}\text{Fm}$  CS 2JPNJAE 8.2+07 1.0+08 Jour PRL,93,(16),162701 Oct 04 K.Nishio+ E1916

**92 Uranium 236**

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$d,p+f$		CSP	1USAYAL	2.4+07		Jour	PR/C,71,051602	05	C.Plettner+	C1275
$d,p+f$		?	1USAYAL	2.4+07		Jour	PR/C,71,051602	05	C.Plettner+	C1275

**92 Uranium 238**

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$d,^6\text{Li}$	$^{234}\text{Th}$	DAP	1USAMSU	5.5+07		Jour	BAP,24,686	79	J.Janecke+	C1315
$d,d+f$		?	1USAYAL	2.4+07		Jour	PR/C,71,051602	05	C.Plettner+	C1275
$d,p+f$		CSP	1USAYAL	2.4+07		Jour	PR/C,71,051602	05	C.Plettner+	C1275

**97 Berkelium 249**

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$p,t$	$^{247}\text{Bk}$	DAP	1USAPTN	1.5+07		Jour	NP/A,399,1	83	R.A.Dewberry+	C1319