

Nuclear Reaction Data Center (JCPRG)

EXFOR : Recent Compilation (Added in October 2007)

EXFOR is a world-wide database for experimental neutron induced, charged-particle induced and photonuclear reaction compiled by Nuclear Reaction Data Centres Network coordinated by IAEA Nuclear Data Section. This list gives newly compiled data to EXFOR. *This list consists of tables titled by target nuclide.*

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	TTP	Partial thick target yield

Special codes in outgoing particle field

abs	Absorption	fus	Fusion	sct	Scattering	tot	Total
el	Elastic	inel	Inelastic	tcx	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)

1 Hydrogen 1

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,el</i>	¹ H	POD	2NEDKVI	1.9+08	1.9+08	Jour	NIM/A,562,338	06	H.R.Amir-Ahmadi+	O1422
<i>d,n+p</i>	¹ H	?	2NEDKVI	1.3+08	1.3+08	Jour	PL/B,641,23	06	St.Kistryn+	O1450
<i>d,n+p</i>	¹ H	?	2NEDKVI	1.3+08	1.3+08	Jour	PR/C,72,044006	05	St.Kistryn+	O1518

1 Hydrogen 2

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
⁹ Li, <i>p</i>	¹⁰ Li	DA	2ZZZCER	2.1+07	2.1+07	Jour	PL/B,642,449	06	H.B.Jeppesen+	O1410
¹⁸ F, <i>p</i>	¹⁹ F	DAP	2BLGLEU	1.4+07	1.4+07	Jour	NP/A,791,251	07	N.Desereville+	O1515

2 Helium 3

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>α,γ</i>	⁷ Be	CS	2ITYLGS	1.1+05	1.1+05	Jour	PR/C,75,035805	07	Gy.Gyuerky+	O1520
<i>α,γ</i>	⁷ Be	CS	2ITYLGS	9.3+04	1.7+05	Jour	PR/C,75,065803	07	F.Confortola+	O1516

4 Beryllium 9

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
⁹ Be, <i>el</i>	⁹ Be	DA	3AULCBB	3.5+07	5.0+07	Jour	PR/C,30,896	84	A.R.Omar+	O1527
⁹ Be, <i>fus</i>		CS	3AULCBB	3.5+07	5.5+07	Jour	PR/C,30,1516	84	A.R.Omar+	O1528
⁹ Be, <i>fus</i>		DA	3AULCBB	3.5+07	5.5+07	Jour	PR/C,30,1516	84	A.R.Omar+	O1528
⁹ Be, <i>inel</i>	⁹ Be	DAP	3AULCBB	3.5+07	5.0+07	Jour	PR/C,30,896	84	A.R.Omar+	O1527

5 Boron 10

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>α,⁷Li</i>	⁷ Be	DA	2GERJUL	9.2+07	9.2+07	Jour	PR/C,33,934	86	L.Jarczyk+	O1526

6 Carbon 12

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,⁶Li</i>	⁷ Be	DAP	2ITYMIL	4.0+07	4.0+07	Jour	PR/C,31,656	85	G.D'Erasmio+	O1523
<i>p,x+p</i>	inclusive	POD	2FR SAT	5.2+08	2.8+09	Jour	NCL,41,285	84	J.Bystricky+	O1546

$d, {}^7\text{Li}$	${}^7\text{Be}$	DA	2GERJUL	7.8+07	7.8+07	Jour	PR/C,33,934	86	L.Jarczyk+	O1526
${}^6\text{Li}, {}^6\text{He}$	${}^{12}\text{N}$	DAP	2GERKFK	1.6+08	1.6+08	Jour	PR/C,41,2925	90	M.Moosburger+	O1530
${}^{12}\text{Be}, \text{inel}$	${}^{12}\text{C}$	CSP	2FR GAN	4.7+08	4.7+08	Jour	PRL,96,032502	06	S.D.Pain+	O1533
${}^{12}\text{C}, \text{el}$	${}^{12}\text{C}$	DA	2ZZZCER	1.0+09	1.0+09	Jour	PL/B,102,242	81	M.Buenerd+	O1319
${}^{12}\text{C}, \text{el}$	${}^{12}\text{C}$	DA	2FR GRE	3.6+08	3.6+08	Jour	NP/A,424,313	84	M.Buenerd+	O1519
${}^{12}\text{C}, \text{inel}$	${}^{12}\text{C}$	DAP	2ZZZCER	1.0+09	1.0+09	Jour	PL/B,102,242	81	M.Buenerd+	O1319
${}^{12}\text{C}, \text{inel}$	${}^{12}\text{C}$	DAP	2FR GRE	3.6+08	3.6+08	Jour	NP/A,424,313	84	M.Buenerd+	O1519
${}^{13}\text{C}, \text{fus}$		CS	3AULCBR	1.9+07	2.9+07	Jour	PR/C,30,1516	84	A.R.Omar+	O1528
${}^{16}\text{O}, \text{el}$	${}^{12}\text{C}$	DA	2FR GRE	6.1+08	6.1+08	Jour	PR/C,34,1484	86	M.E.Brandan+	O1517
${}^{16}\text{O}, \text{inel}$	${}^{12}\text{C}$	DAP	2FR GRE	6.1+08	6.1+08	Jour	PR/C,34,1484	86	M.E.Brandan+	O1517
${}^{16}\text{O}, \text{inel}$	${}^{12}\text{C}$	DAP	2FR STR	6.2+07	1.2+08	Jour	NP/A,779,21	06	S.Szilner+	O1456
${}^{18}\text{O}, {}^{10}\text{Be}$	${}^{20}\text{Ne}$	DAP	2FR STR	8.5+07	8.5+07	Jour	NP/A,779,21	06	S.Szilner+	O1456
${}^{18}\text{O}, {}^{11}\text{B}$	${}^{19}\text{F}$	DAP	2FR STR	8.5+07	8.5+07	Jour	NP/A,779,21	06	S.Szilner+	O1456
${}^{18}\text{O}, {}^{13}\text{C}$	${}^{17}\text{O}$	DAP	2FR STR	8.5+07	8.5+07	Jour	NP/A,779,21	06	S.Szilner+	O1456
${}^{18}\text{O}, {}^{14}\text{C}$	${}^{16}\text{O}$	DA	2FR STR	8.5+07	8.5+07	Jour	NP/A,779,21	06	S.Szilner+	O1456
${}^{18}\text{O}, {}^{14}\text{C}$	${}^{16}\text{O}$	DAP	2FR STR	8.5+07	8.5+07	Jour	NP/A,779,21	06	S.Szilner+	O1456
${}^{18}\text{O}, {}^{15}\text{N}$	${}^{15}\text{N}$	DA	2FR STR	8.5+07	8.5+07	Jour	NP/A,779,21	06	S.Szilner+	O1456
${}^{18}\text{O}, {}^{15}\text{N}$	${}^{15}\text{N}$	DAP	2FR STR	8.5+07	8.5+07	Jour	NP/A,779,21	06	S.Szilner+	O1456
${}^{18}\text{O}, \text{el}$	${}^{12}\text{C}$	DA	2FR STR	6.6+07	1.2+08	Conf	99RAB,,180	99	S.Szilner+	O1535
${}^{18}\text{O}, \text{el}$	${}^{12}\text{C}$	DA	2FR STR	8.5+07	8.5+07	Jour	NP/A,779,21	06	S.Szilner+	O1456
${}^{18}\text{O}, \text{inel}$	${}^{12}\text{C}$	DAP	2FR STR	8.5+07	8.5+07	Jour	NP/A,779,21	06	S.Szilner+	O1456

6 Carbon 13

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
${}^9\text{Be}, \text{el}$	${}^{13}\text{C}$	DA	2ITYPAD	5.0+07	5.0+07	Jour	PR/C,41,2425	90	A.Barbadoro+	O1451
${}^9\text{Be}, \text{inel}$	${}^{13}\text{C}$	DAP	2ITYPAD	5.0+07	5.0+07	Jour	PR/C,41,2425	90	A.Barbadoro+	O1451

8 Oxygen 16

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
${}^{16}\text{O}, \text{el}$	${}^{16}\text{O}$	DA	3ISLWZI	9.0+06	3.3+07	Jour	PR/C,18,1688	78	I.Tserruya+	O1541
${}^{16}\text{O}, \text{fus}$		CS	3ISLWZI	1.3+07	3.3+07	Jour	PR/C,18,1688	78	I.Tserruya+	O1541
${}^{16}\text{O}, \text{fus}$		DA	3ISLWZI	3.2+07	5.7+07	Jour	PR/C,18,1688	78	I.Tserruya+	O1541

8 Oxygen 18

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
${}^6\text{Li}, {}^6\text{He}$	${}^{18}\text{F}$	DAP	2GERKFK	1.6+08	1.6+08	Jour	PR/C,41,2925	90	M.Moosburger+	O1530

12 Magnesium 26

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
${}^6\text{Li}, {}^6\text{He}$	${}^{26}\text{Al}$	DAP	2GERKFK	1.6+08	1.6+08	Jour	PR/C,41,2925	90	M.Moosburger+	O1530

14 Silicon 28

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$\alpha, ^2\text{He}$	^{30}Si	DAP	2NEDKVI	6.5+07	6.5+07	Jour	PR/C,16,2442	77	R.J.Demeijer+	O1544
$^9\text{Be, fus}$		CS	3AULCBR	2.3+07	4.7+07	Jour	PR/C,21,2352	80	J.S.Eck+	O1536
$^9\text{Be, fus}$		DA	3AULCBR	3.0+07	6.0+07	Jour	PR/C,21,2352	80	J.S.Eck+	O1536

14 Silicon 30

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
p, α	^{27}Al	DAP	2ITYMIL	4.1+07	4.1+07	Jour	PR/C,18,613	78	F.Pellegrini+	O1542
p, el	^{30}Si	DA	2ITYMIL	4.1+07	4.1+07	Jour	PR/C,18,613	78	F.Pellegrini+	O1542

20 Calcium

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^{12}\text{C, el}$	^{nat}Ca	DA	2ZZZCER	1.0+09	1.0+09	Jour	PL/B,102,242	81	M.Buenerd+	O1319

20 Calcium 40

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^9\text{Be, fus}$		CS	3AULCBR	3.5+07	6.0+07	Jour	PR/C,27,1807	83	J.S.Eck+	O1529
$^9\text{Be, fus}$		DA	3AULCBR	3.5+07	6.0+07	Jour	PR/C,27,1807	83	J.S.Eck+	O1529

20 Calcium 42

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^6\text{Li, } ^6\text{He}$	^{42}Sc	DAP	2GERKFK	1.6+08	1.6+08	Jour	PR/C,41,2925	90	M.Moosburger+	O1530

20 Calcium 48

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^6\text{Li, } ^6\text{He}$	^{48}Sc	DAP	2GERKFK	1.6+08	1.6+08	Jour	PR/C,41,2698	90	H.Wirth+	O1537

28 Nickel 58

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^{16}\text{O,el}$	^{58}Ni	DA	3AULCBR	4.0+07	4.0+07	Jour	NP/A,628,1	98	N.Keely+	O1532
$^{16}\text{O,fus}$		CS	3AULCBR	2.9+07	4.1+07	Jour	NP/A,628,1	98	N.Keely+	O1532
$^{16}\text{O,fus}$		DA	3AULCBR	6.0+07	6.0+07	Jour	NP/A,628,1	98	N.Keely+	O1532

28 Nickel 62

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
α,γ	^{66}Zn	CS	2GERBOC	4.6+06	8.4+06	Jour	PR/C,76,015802	07	A.Spyrou+	O1534
$^{16}\text{O,el}$	^{62}Ni	DA	3AULCBR	4.0+07	4.0+07	Jour	NP/A,628,1	98	N.Keely+	O1532
$^{16}\text{O,fus}$		CS	3AULCBR	2.8+07	4.6+07	Jour	NP/A,628,1	98	N.Keely+	O1532

39 Yttrium 89

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^{12}\text{C,el}$	^{89}Y	DA	2ZZZCER	1.0+09	1.0+09	Jour	PL/B,102,242	81	M.Buenerd+	O1319

40 Zirconium 90

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^6\text{Li},^6\text{He}$	^{90}Nb	DAP	2GERKFK	1.6+08	1.6+08	Jour	PR/C,41,2698	90	H.Wirth+	O1537

45 Rhodium 103

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
p,γ	^{104}Pd	CS	2GERBOC	3.0+06	4.9+06	Jour	PR/C,76,015802	07	A.Spyrou+	O1534

46 Palladium 110

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^{18}\text{O},^{14}\text{C}$	^{114}Cd	CSP	3BZLUSP	4.7+07	5.5+07	Jour	PR/C,74,034608	06	D.Pereira+	O1449
$^{18}\text{O},^{16}\text{O}$	^{112}Pd	CSP	3BZLUSP	4.4+07	5.5+07	Jour	PR/C,74,034608	06	D.Pereira+	O1449
$^{18}\text{O,el}$	^{110}Pd	DA	3BZLUSP	5.0+07	5.5+07	Jour	PR/C,74,034608	06	D.Pereira+	O1449
$^{18}\text{O,inel}$	^{110}Pd	CSP	3BZLUSP	3.8+07	5.5+07	Jour	PR/C,74,034608	06	D.Pereira+	O1449

50 Tin 115

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^3\text{He},d$	^{116}Sb	DAP	2NEDFUL	2.8+07	2.8+07	Jour	PR/C,17,1555	78	R.Kamermans+	O1543

52 Tellurium 125

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$p,2n$	^{124}I	TT	3KORKRM	2.2+07	2.2+07	Jour	JLCR,50,511	07	J.H.Kim+	O1538

62 Samarium 144

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^9\text{Be},2n$	^{151}Dy	CS	3ARGCNE	3.0+07	4.4+07	Jour	PR/C,73,064606	06	P.B.S.Gomes+	O1435
$^9\text{Be},2n+p$	^{150}Tb	CS	3ARGCNE	3.2+07	4.4+07	Jour	PR/C,73,064606	06	P.B.S.Gomes+	O1435
$^9\text{Be},3n$	^{150}Dy	CS	3ARGCNE	3.0+07	4.4+07	Jour	PR/C,73,064606	06	P.B.S.Gomes+	O1435
$^9\text{Be},4n$	^{149}Dy	CS	3ARGCNE	4.0+07	4.4+07	Jour	PR/C,73,064606	06	P.B.S.Gomes+	O1435
$^9\text{Be},el$	^{144}Sm	DA	3ARGCNE	3.3+07	4.1+07	Jour	PR/C,73,064606	06	P.B.S.Gomes+	O1435
$^9\text{Be},fus$		CS	3ARGCNE	2.8+07	4.1+07	Jour	PR/C,73,064606	06	P.B.S.Gomes+	O1435
$^9\text{Be},inel$	^{144}Sm	CSP	3ARGCNE	2.8+07	4.1+07	Jour	PR/C,73,064606	06	P.B.S.Gomes+	O1435
$^9\text{Be},n$	^{152}Dy	CS	3ARGCNE	3.0+07	4.1+07	Jour	PR/C,73,064606	06	P.B.S.Gomes+	O1435
$^9\text{Be},n+p$	^{151}Tb	CS	3ARGCNE	3.0+07	4.4+07	Jour	PR/C,73,064606	06	P.B.S.Gomes+	O1435
$^9\text{Be},non$		CS	3ARGCNE	2.8+07	4.1+07	Jour	PR/C,73,064606	06	P.B.S.Gomes+	O1435
$^9\text{Be},x$	^{147}Gd	CS	3ARGCNE	2.8+07	4.1+07	Jour	PR/C,73,064606	06	P.B.S.Gomes+	O1435

73 Tantalum 181

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^{12}\text{C},x$	Many	CS	2ZZZCER	1.6+08	9.2+08	Jour	PR/C,26,2447	82	M.Desaintsimon+	O1540

79 Gold 197

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$d,^3\text{He}$	^{196}Pt	DAP	2NEDKVI	5.0+07	5.0+07	Jour	PR/C,31,653	85	N.Blasi+	O1522
$^3\text{He},d$	^{198}Hg	DAP	2NEDKVI	5.0+07	5.0+07	Jour	PR/C,26,1893	82	N.Blasi+	O1454
$^{12}\text{C},fis$	Many	CS	2ZZZCER	3.6+08	1.1+09	Jour	PR/C,38,576	88	R.Trockel+	O1602
$^{12}\text{C},x$	Many	DA	2ZZZCER	1.0+09	1.0+09	Jour	NP/A,432,525	85	R.H.Kraus+	O1531

82 Lead 208

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^{12}\text{C},\text{el}$	^{208}Pb	DA	2ZZZCER	1.0+09	1.0+09	Jour	PL/B,102,242	81	M.Buenerd+	O1319
$^{13}\text{C},\text{el}$	^{208}Pb	DA	2FR GRE	3.9+08	3.9+08	Jour	NP/A,424,313	84	M.Buenerd+	O1519

83 Bismuth 209

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
p,x	^3He	CS	2FR SAT	1.0+08	2.6+09	Conf	2007NICE,,79(#327)	07	I.Leya+	O1412
$p,x+\alpha$	inclusive	CS	2FR SAT	1.0+08	2.6+09	Conf	2007NICE,,79(#327)	07	I.Leya+	O1412

92 Uranium 238

Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
$^{11}\text{B},\text{fis}$	Many	CS	4ZZZDUB	8.5+07	8.5+07	Jour	PR/C,14,2185	76	M.Desaint-Simon+	O1545
$^{12}\text{C},x$	Many	CS	2ZZZCER	1.6+08	9.2+08	Jour	PR/C,26,2447	82	M.Desaintsimon+	O1540
$^{12}\text{C},x$	Many	DA	2ZZZCER	1.0+09	1.0+09	Jour	PR/C,33,885	86	K.Aleklett+	O1524
$^{22}\text{Ne},\text{fis}$	Many	CS	4ZZZDUB	1.3+08	1.6+08	Jour	PR/C,14,2185	76	M.Desaint-Simon+	O1545