EXFOR News (June 2014)

New experimental data available from Nuclear Reaction Data Centres

EXFOR is a world-wide data library for experimental neutron induced, charged-particle induced and photonuclear reaction data compiled by the International Network of the Nuclear Reaction Data Centres (NRDC)[a] coordinated by the IAEA Nuclear Data Section. Regularly updated retrieval database is available at NNDC, NEADB, IAEA-NDS, JAEA, JCPRG and CDFE. Please send an email to N.Otsuka (NRDC Coordinator n.otsuka@iaea.org) for inclusion to the EXFOR News distribution list or any question on EXFOR.

Quantity codes

ALF	α-value ($\sigma_{\rm capt}/\sigma_{\rm fis}$)	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	Fission neutron multiplicity $\bar{\nu}$
D3A	Triple differential $\mathrm{d}\Omega_1/\mathrm{d}\Omega_2/\mathrm{d}E'$	NUD	Delayed fission neutron multiplicity $\bar{\nu}_d$
D3E	Triple differential $\mathrm{d}\Omega/\mathrm{d}E'_1/\mathrm{d}E'_2$	NUF	Fragment neutrons
D4A	Quadruple diff. $\mathrm{d}\Omega_1/\mathrm{d}\Omega_2/\mathrm{d}E'_1/\mathrm{d}E'_2$	POL	Polarization
DA	Differential $\mathrm{d}/\mathrm{d}\Omega$	POD	Differential polarization
DAA	Double differential $\mathrm{d}\Omega_1/\mathrm{d}\Omega_2$	PY	Product yield (other than fission)
DAE	Double differential $\mathrm{d}\Omega/\mathrm{d}E'$	RI	Resonance integral
DAP	Partial differential $\mathrm{d}/\mathrm{d}\Omega$	RP	Resonance parameter
DAT	Temperature-dependent Legendre coefficient	RR	Reaction rate
DE	Differential $\mathrm{d}/\mathrm{d}E'$	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	η-value $\bar{\nu}\sigma_{\rm fis}/(\sigma_{\rm capt}+\sigma_{\rm fis})$	TTD	Differential thick target yield, $\mathrm{d}/\mathrm{d}\Omega$
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)

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

1 Hydrogen 2

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
^{17}N,p	^{18}N	?	1USAANL	2.3+08	2.3+08	Jour	PR/C,88,044317	13	C.R.Hoffman+	C2066

2 Helium 3

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
d,p	^{4}He	CS	1USAMIN	4.3+05	4.3+05	Jour	PR,90,292	53	J.L.Yarnell+	C0987
d,p	^{4}He	DA	1USAMIN	2.4+05	9.1+05	Jour	PR,90,292	53	J.L.Yarnell+	C0987

3 Lithium 7

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
^{8}Li,el	^{7}Li	DA	1CANTMF	1.1+07	1.1+07	Jour	PR/C,88,025804	13	D.Howell+	C2052

4 Beryllium 10

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
p,el	^{10}Be	DA	1USAORL	6.0+06	1.1+07	Jour	PR/C,88,064612	13	K.T.Schmitt+	C2088
d,el	^{10}Be	DA	1USAORL	1.2+07	2.1+07	Jour	PR/C,88,064612	13	K.T.Schmitt+	C2088
d,inel	^{10}Be	DAP	1USAORL	1.2+07	2.1+07	Jour	PR/C,88,064612	13	K.T.Schmitt+	C2088
d,p	^{11}Be	DAP	1USAORL	1.2+07	2.1+07	Jour	PR/C,88,064612	13	K.T.Schmitt+	C2088

5 Boron 11

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
n,0		RP	1USAANL			Jour	NP,82,16	66	F.P.Mooring+	11197

6 Carbon 12

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,2p	^{10}Be	DAA	2GERMNZ	1.4+08	4.0+08	Jour	PRL,80,245	98	J.D.Macgregor+	M0873
γ,n+p	^{10}B	DAA	2GERMNZ	1.2+08	1.5+08	Jour	EPJ/A,1,241	98	T.T.-H.Yau+	M0872
γ,n+p	^{10}B	DAA	2GERMNZ	1.4+08	4.0+08	Jour	PRL,80,245	98	J.D.Macgregor+	M0873
d,p	^{13}C	DA	1USABNW	9.4+05	9.4+05	Jour	NIM/B,222,538	04	W.Jiang+	C1471
^{16}O,γ	^{28}Si	?	1CANTMF	6.6+06	9.0+06	Jour	PR/C,89,014305	14	A.Goasduff+	C2025

7 Nitrogen 14

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
p,el	^{14}N	DA	1USAMIN	1.4+06	3.5+06	Jour	PR,105,210	57	C.R.Bolmgren+	C2089

10 Neon 21

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
α,n		RP	1USAORL	1.0+06	5.0+06	Jour	PR/C,7,2432	73	F.X.Haas+	C0515

10 Neon 22

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
α,n		RP	1USAORL	1.0+06	5.0+06	Jour	PR/C,7,2432	73	F.X.Haas+	C0515

11 Sodium 23

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
n,γ	^{24}Na	CS	3HUNII	2.5-02	2.5-02	Jour	PR/C,89,014617	14	R.B.Firestone+	31736
n,γ	^{24}Na	CSP	3HUNII	2.5-02	2.5-02	Jour	PR/C,89,014617	14	R.B.Firestone+	31736

22 Titanium 46

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,n	^{45}Ti	?	3AULCBR		3.1+07	Jour	NP,29,292	62	T.R.Sherwood+	M0869
γ,x	^{44}Sc	CS	3AULCBR	2.2+07	3.1+07	Jour	NP,29,292	62	T.R.Sherwood+	M0869
γ,x	^{44}Sc	INT	3AULCBR		3.1+07	Jour	NP,29,292	62	T.R.Sherwood+	M0869
γ,x	^{45}Ti	?	3AULCBR	1.4+07	3.1+07	Jour	NP,29,292	62	T.R.Sherwood+	M0869

22 Titanium 47

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,p	^{46}Sc	?	3AULCBR		3.1+07	Jour	NP,29,292	62	T.R.Sherwood+	M0869

22 Titanium 48

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,p	^{47}Sc	?	3AULCBR		3.1+07	Jour	NP,29,292	62	T.R.Sherwood+	M0869

22 Titanium 49

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,p	^{48}Sc	?	3AULCBR		3.1+07	Jour	NP,29,292	62	T.R.Sherwood+	M0869

22 Titanium 50

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,p	^{49}Sc	CS	3AULCBR	1.3+07	3.1+07	Jour	NP,29,292	62	T.R.Sherwood+	M0869
γ,p	^{49}Sc	INT	3AULCBR		3.1+07	Jour	NP,29,292	62	T.R.Sherwood+	M0869

26 Iron 54

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,x	^{52}Mn	CS	4UKRKFT		4.4+07	Conf	2012KYIV,,132	13	O.A.Bezshyyko+	G4047

39 Yttrium 89

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
^{3}He,d	^{90}Zr	DAP	1USAORL	2.5+07	2.5+07	Jour	PR,177,1558	69	G.Vourvopoulos+	C2055

42 Molybdenum 98

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
n,γ	^{99}Mo	CS	3IRNIRN			Jour	ANE,63,653	14	A.R.Jokar+	31742

44 Ruthenium 96

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,n	^{95}Ru	?	4UKRKFT		1.4+07	Conf	2012KYIV,,570	13	Ye.Skakun+	G4046

44 Ruthenium 98

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,n	^{97}Ru	?	4UKRKFT		1.4+07	Conf	2012KYIV,,570	13	Ye.Skakun+	G4046

44 Ruthenium 104

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,n	^{103}Ru	?	4UKRKFT		1.4+07	Conf	2012KYIV,,570	13	Ye.Skakun+	G4046

46 Palladium 102

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,n	^{101}Pd	?	4UKRKFT		1.4+07	Conf	2012KYIV,,570	13	Ye.Skakun+	G4046

46 Palladium 110

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,n	^{109}Pd	?	4UKRKFT		1.4+07	Conf	2012KYIV,,570	13	Ye.Skakun+	G4046

47 Silver 107

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,n	^{106}Ag	CS	4ZZZDUB		2.4+07	Jour	JRN,292,477	14	Tranducthiep+	M0871

49 Indium 113

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,2n	^{111}In	CS	4UZ NUU		3.5+07	Jour	PAN,77,35	14	S.R.Palvanov	G0041
γ,n	^{112}In	CS	4UZ NUU		3.5+07	Jour	PAN,77,35	14	S.R.Palvanov	G0041
n,2n	^{112}In	CS	4UZ UZB	1.4+07	1.4+07	Jour	PAN,77,35	14	S.R.Palvanov	31737

51 Antimony 121

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,3n	^{118}Sb	CS	4UKRKFT		4.3+07	Conf	2012KYIV,,127	13	O.A.Bezshyyko+	G4043

γ,5n	^{116}Sb	CS	4UKRKFT		5.3+07	Conf	2012KYIV,,127	13	O.A.Bezshyyko+	G4043

52 Tellurium 124

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,n	^{123}Te	CS	4UKRIEP		2.2+07	Jour	UZHV,29,162	11	T.V.Poltorzhytska+	G4041

52 Tellurium 128

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,n	^{127}Te	CS	4UKRIEP		2.2+07	Jour	PR/C,87,044604	13	V.M.Mazur+	G4042

52 Tellurium 130

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,el	^{130}Te	CS	1USATNL	5.5+06	8.2+06	Jour	PL/B,727,361	13	J.Isaak+	L0193
γ,inel	^{130}Te	CS	1USATNL	5.5+06	8.2+06	Jour	PL/B,727,361	13	J.Isaak+	L0193
γ,n	^{129}Te	CS	4UKRIEP		2.2+07	Jour	PR/C,87,044604	13	V.M.Mazur+	G4042
γ,sct	^{130}Te	CS	1USATNL	5.5+06	8.2+06	Jour	PL/B,727,361	13	J.Isaak+	L0193

54 Xenon 124

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,sct	^{124}Xe	CS	2GERZFK	5.2+06	1.1+07	Jour	PRL,112,072501	14	R.Massarczyk+	G0042

54 Xenon 128

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,sct	^{128}Xe	CS	2GERZFK	5.2+06	9.6+06	Jour	PRL,112,072501	14	R.Massarczyk+	G0042

54 Xenon 132

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,sct	^{132}Xe	CS	2GERZFK	5.2+06	8.8+06	Jour	PRL,112,072501	14	R.Massarczyk+	G0042

54 Xenon 134

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,sct	^{134}Xe	CS	2GERZFK	5.2+06	8.6+06	Jour	PRL,112,072501	14	R.Massarczyk+	G0042

74 Tungsten

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
n,γ		CSP	3HUNII	2.5-02	2.5-02	Jour	PR/C,89,014606	14	A.M.Hurst+	31735

74 Tungsten 182

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
n,γ	^{183}W	CS	3HUNII	2.5-02	2.5-02	Jour	PR/C,89,014606	14	A.M.Hurst+	31735
n,γ	^{183}W	CSP	3HUNII	2.5-02	2.5-02	Jour	PR/C,89,014606	14	A.M.Hurst+	31735

74 Tungsten 183

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
n,γ	^{184}W	CS	3HUNII	2.5-02	2.5-02	Jour	PR/C,89,014606	14	A.M.Hurst+	31735
n,γ	^{184}W	CSP	3HUNII	2.5-02	2.5-02	Jour	PR/C,89,014606	14	A.M.Hurst+	31735

74 Tungsten 184

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
n,γ	^{185}W	CS	3HUNII	2.5-02	2.5-02	Jour	PR/C,89,014606	14	A.M.Hurst+	31735
n,γ	^{185}W	CSP	3HUNII	2.5-02	2.5-02	Jour	PR/C,89,014606	14	A.M.Hurst+	31735

74 Tungsten 186

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
n,γ	^{187}W	CS	3HUNII	2.5-02	2.5-02	Jour	PR/C,89,014606	14	A.M.Hurst+	31735
n,γ	^{187}W	CSP	3HUNII	2.5-02	2.5-02	Jour	PR/C,89,014606	14	A.M.Hurst+	31735

83 Bismuth 209

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

γ,p	^{208}Pb	DAP	2SWDLND	4.4+07	5.2+07	Jour	PR/C,63,014310	00	D.Branford+	M0874

90 Thorium 232

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,fis		NU	1USALRL	5.6+06	1.7+07	Jour	NSE,73,(2),153	80	J.T.Caldwell+	L0185
γ,fis		NUD	1USALRL	1.1+07	1.7+07	Jour	NSE,73,(2),153	80	J.T.Caldwell+	L0185

92 Uranium 235

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,fis		NU	1USALRL	6.5+06	1.8+07	Jour	NSE,73,(2),153	80	J.T.Caldwell+	L0185
γ,fis		NUD	1USALRL	1.1+07	1.7+07	Jour	NSE,73,(2),153	80	J.T.Caldwell+	L0185
n,fis	Many	FY	4UZ UZB	2.5-02	2.5-02	Jour	PAN,77,39	14	Yu.N.Koblik+	31738

92 Uranium 236

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,fis		NU	1USALRL	6.5+06	1.7+07	Jour	NSE,73,(2),153	80	J.T.Caldwell+	L0185
γ,fis		NUD	1USALRL	1.1+07	1.1+07	Jour	NSE,73,(2),153	80	J.T.Caldwell+	L0185

92 Uranium 238

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Max	Type	Documentation Ref Vol Page	Date	Author	Data #
γ,fis		CS	4RUSJIA	1.0+07	1.0+07	Jour	YF,76,1529	13	L.Z.Dzhilavyan+	M0870
γ,fis		NU	1USALRL	6.0+06	1.7+07	Jour	NSE,73,(2),153	80	J.T.Caldwell+	L0185
γ,fis		NUD	1USALRL	1.1+07	1.7+07	Jour	NSE,73,(2),153	80	J.T.Caldwell+	L0185