EXFOR News (August 2022)

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)[a] co-ordinated 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 pubslished in past 10 years are flagged by asterisks (*). Please send an email to the NRDC Coordinator (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	α-value ($\sigma_{\rm capt}/\sigma_{\rm fis}$)	KE	Kinetic energy
AMP	Scattering length	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/dΩ	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/dΩ	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	η-value = $\bar{\nu}\sigma_{\rm fis}/(\sigma_{\rm capt}+\sigma_{\rm fis})$	TT	Thick target yield
EVL	Evaluation	TTD	Differential thick target yield, d/dΩ
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	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), CDFE (Russia), CNPD (Russia), UkrNDC (Ukraine)

1 Hydrogen 1

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	^{8}He,el	^{1}H	?	1CANTMF	6.6+07	6.6+07	Jour	PL/B,822,136710	21	M.Holl+	C2684
*	^{8}He,inel	^{1}H	?	1CANTMF	6.6+07	6.6+07	Jour	PL/B,822,136710	21	M.Holl+	C2684
*	^{7}Be,el	^{1}H	?	1USAORL	4.7+05	2.7+06	Jour	PR/C,99,045807	19	S.N.Paneru+	C2695
*	^{7}Be,inel	^{1}H	?	1USAORL	1.1+06	2.7+06	Jour	PR/C,99,045807	19	S.N.Paneru+	C2695
*	^{11}Be,d	^{10}Be	?	1CANTMF	1.1+08	1.1+08	Jour	PR/C,104,044601	21	K.Kuhn+	C2682
*	^{11}Be,el	^{1}H	?	1CANTMF	1.1+08	1.1+08	Jour	PR/C,104,044601	21	K.Kuhn+	C2682
*	^{11}Be,inel	^{1}H	?	1CANTMF	1.1+08	1.1+08	Jour	PR/C,104,044601	21	K.Kuhn+	C2682
*	^{59}Cu,α	^{56}Ni	?	1CANTMF	6.0+06	6.0+06	Jour	PR/C,104,L042801	21	J.S.Randhawa+	C2696

1 Hydrogen 2

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	d,γ	^{4}He	CS	3CPRAEP	1.4+05	2.6+05	Jour	CST,50,395	16	Su Xiao-bin+	S0264
	^{3}He,p	^{4}He	CS	1USAPUR	3.0+05	1.0+06	Rept	LAMS-2	43	C.P.Baker+	C2718
	^{18}F,n	^{19}Ne	DAP	1USAORL	1.5+08	1.5+08	Jour	PR/C,83,052801	11	A.S.Adekola+	C2687
*	^{86}Kr,p	^{87}Kr	?	1USAMSU	2.8+09	2.8+09	Jour	PR/C,99,054625	19	D.Walter+	C2694

1 Hydrogen 3

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	p,γ	^{4}He	CS	4RUSTPI	1.2+04	3.4+04	Jour	ZEP,113,229	21	V.A.Varlachev+	F1455
	^{3}He,γ	^{6}Li	DAP	1USASTF	1.3+07	2.2+07	Jour	NP/A,173,1	71	E.Ventura+	A1081

2 Helium 3

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	d,γ	^{5}Li	CS	1USAMIN	4.5+05	4.5+05	Jour	PR,96,1023	54	J.M.Blair+	A1085

3 Lithium 7

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	p,inel	^{7}Li	CSP	4RUSSIB	6.4+08	2.1+09	Jour	NIM/B,502,85	21	S.Taskaev+	F1452
*	p,inel	^{7}Li	TTD	4RUSSIB	6.5+08	2.2+09	Jour	NIM/B,502,85	21	S.Taskaev+	F1452

4 Berylium 9

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	n,2n+α	^{4}He	CS	4RUSLEB	1.4+07	1.4+07	Jour	JET,13,876	61	S.A.Myachkova+	40790
*	p,α	^{6}Li	CSP	4RUSEPA	2.0+06	5.2+06	Jour	IZV,84,1430	20	L.N.Generalov+	F1457
*	p,α	^{6}Li	DAP	4RUSEPA	2.5+06	2.6+06	Jour	IZV,84,1430	20	L.N.Generalov+	F1457
*	p,n	^{9}B	DAP	4RUSEPA	2.2+06	2.9+06	Jour	IZV,84,1430	20	L.N.Generalov+	F1457
	α,n	^{12}C	DE	1USALAS	5.4+06	5.4+06	Rept	LA-111	44	H.T.Richards+	C2717
	α,n	^{12}C	KE	1USALAS	5.4+06	5.4+06	Rept	LA-111	44	H.T.Richards+	C2717
	α,x+n	inclusive	PY	1USALAS	9.6+05	5.1+06	Rept	LA-136	44	E.Segre+	C2716
*	^{13}O,x	^{13}F	CS	1USAMSU	9.0+08	9.0+08	Jour	PRL,126,132501	21	R.J.Charity+	C2686
*	^{33}Mg,x	^{32}Mg	CS	1USAMSU	3.3+09	3.3+09	Jour	PL/B,822,136682	21	N.Kitamura+	C2683
*	^{34}Si,x	^{32}Mg	CS	1USAMSU	3.2+09	3.2+09	Jour	PL/B,822,136682	21	N.Kitamura+	C2683
*	^{49}Ti,x	^{48}Ti	?	1USAMSU	4.1+09	4.1+09	Jour	PL/B,823,136757	21	R.Yajzey+	C2699
*	^{49}Fe,x	^{48}Fe	?	1USAMSU	3.9+09	3.9+09	Jour	PL/B,823,136757	21	R.Yajzey+	C2699

5 Boron

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	α,x+n	inclusive	PY	1USALAS	1.9+06	5.1+06	Rept	LA-136	44	E.Segre+	C2716

5 Boron 10

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	n,α	^{7}Li	CS	1USALAS	5.8+05	5.8+05	Rept	LA-46	44	C.L.Bailey+	14724
	n,α	^{7}Li	?	1USALAS	1.6+04	1.7+06	Rept	LA-46	44	C.L.Bailey+	14724

6 Carbon

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	^{14}C,x	^{13}C	CS	3CPRIMP	3.3+09	3.3+09	Jour	PR/C,104,014310	21	Y.Z.Sun+	S0277
*	^{15}C,x	^{14}C	CS	3CPRIMP	3.6+09	3.6+09	Jour	PR/C,104,014310	21	Y.Z.Sun+	S0277
*	^{16}C,x	^{15}C	CS	3CPRIMP	3.8+09	3.8+09	Jour	PR/C,104,014310	21	Y.Z.Sun+	S0277

6 Carbon 12

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	d,n	^{13}N	CS	4RUSEPA	1.0+06	1.2+07	Jour	IZV,84,1440	20	L.N.Generalov+	F1458
	α,el	^{12}C	DA	4RUSMOS	1.8+07	2.5+07	Rept	MSU-INP-90-25/171	90	A.V.Ignatenko+	F1464
	α,inel	^{12}C	DAP	4RUSMOS	1.7+07	2.5+07	Rept	MSU-INP-90-25/171	90	A.V.Ignatenko+	F1464
*	^{7}Be,el	^{12}C	DA	1USAORL	4.3+06	9.4+06	Jour	PR/C,99,045807	19	S.N.Paneru+	C2695

6 Carbon 13

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	p,0		RP	1USASTF			Jour	NP/A,175,462	71	F.Riess+	C2679
	p,γ	^{14}N	DAP	1USASTF	3.0+06	1.8+07	Jour	NP/A,175,462	71	F.Riess+	C2679
	p,inel	^{13}C	DAP	1USASTF	3.6+06	1.7+07	Jour	NP/A,175,462	71	F.Riess+	C2679
*	α,n	^{16}O	CS	4RUSFEI	2.1+06	6.1+06	Jour	PR/C,105,024612	22	P.S.Prusachenko+	F1460
*	α,n	^{16}O	DAP	4RUSFEI	2.1+06	6.1+06	Jour	PR/C,105,024612	22	P.S.Prusachenko+	F1460

7 Nitrogen 14

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	d,n	^{15}O	CS	4RUSEPA	1.4+06	1.2+07	Jour	IZV,84,1440	20	L.N.Generalov+	F1458
*	d,x	^{11}C	CS	4RUSEPA	4.6+06	1.2+07	Jour	IZV,84,1440	20	L.N.Generalov+	F1458
*	d,x	^{13}N	CS	4RUSEPA	4.5+06	1.2+07	Jour	IZV,84,1440	20	L.N.Generalov+	F1458

7 Nitrogen 15

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	p,α	^{12}C	DA	3CPRIMP	1.6+05	3.5+05	Jour	CST,35,496	01	Wang Tieshan+	S0261
	p,γ	^{16}O	POD	1USASTF	7.4+06	1.5+07	Jour	PL/B,40,631	72	S.S.Hanna+	C2680

8 Oxygen 16

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	n,p	^{16}N	CS	2ITYEFR	1.4+07	1.5+07	Jour	NIM/A,995,165107	21	M.Pillon+	23779
*	d,n	^{17}F	CS	4RUSEPA	2.3+06	1.2+07	Jour	IZV,84,1440	20	L.N.Generalov+	F1458

8 Oxygen 17

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	n,p	^{17}N	CS	2ITYEFR	1.4+07	1.5+07	Jour	NIM/A,995,165107	21	M.Pillon+	23779

9 Fluorine 19

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	p,el	^{19}F	DA	3CPRBNU	7.1+05	2.5+06	Jour	CST,42,875	08	Sun Xu-Fang+	S0262
	α,x+n	inclusive	PY	1USALAS	3.1+06	5.1+06	Rept	LA-136	44	E.Segre+	C2716

12 Magnesium

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	p,el	^{nat}Mg	DA	3CPRBNU	7.4+05	2.5+06	Jour	CST,42,875	08	Sun Xu-Fang+	S0262

12 Magnesium 24

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	α,p	^{27}Al	PY	1USANOT	3.4+06	4.7+06	Jour	PR/C,102,035805	20	T.Ahn+	C2697
*	α,p	^{27}Al	RR	1USANOT			Jour	PR/C,102,035805	20	T.Ahn+	C2697

12 Magnesium 25

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	^{7}Li,^{6}He	^{26}Al	DAP	3CPRAEP	3.2+07	3.2+07	Jour	PR/C,102,025804	20	Y.J.Li+	S0087
*	^{7}Li,el	^{25}Mg	DA	3CPRAEP	3.2+07	3.2+07	Jour	PR/C,102,025804	20	Y.J.Li+	S0087

14 Silicon 28

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	^{6}He,non		CS	4ZZZDUB	1.2+08	2.0+08	Jour	IZV,84,1152	20	Yu.G.Sobolev+	F1453
*	^{8}He,non		CS	4ZZZDUB	5.3+07	1.7+08	Jour	IZV,84,1152	20	Yu.G.Sobolev+	F1453
*	^{9}Li,non		CS	4ZZZDUB	1.4+08	3.3+08	Jour	IZV,84,1152	20	Yu.G.Sobolev+	F1453

16 Sulphur 34

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	p,0		RP	1USATNL			Jour	NP/A,284,1	77	D.A.Outlaw+	C2707
	p,el	^{34}S	DA	1USATNL	1.5+06	2.8+06	Jour	NP/A,284,1	77	D.A.Outlaw+	C2707

20 Calcium 48

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	^{11}B,x+α	inclusive	PY	1USAOHO	2.2+07	2.2+07	Jour	PR/C,104,015805	21	A.V.Voinov+	C2654
*	^{11}B,x+n	inclusive	PY	1USAOHO	2.2+07	2.2+07	Jour	PR/C,104,015805	21	A.V.Voinov+	C2654
*	^{11}B,x+p	inclusive	PY	1USAOHO	2.2+07	2.2+07	Jour	PR/C,104,015805	21	A.V.Voinov+	C2654

22 Titanium

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	p,x	^{43}Sc	CS	3CPRIMP	8.8+06	1.8+07	Jour	ARI,173,109713	21	B.Liu+	S0270
*	p,x	^{47}Sc	CS	3CPRIMP	8.8+06	1.8+07	Jour	ARI,173,109713	21	B.Liu+	S0270
*	p,x	^{48}V	CS	3CPRIMP	8.8+06	1.8+07	Jour	ARI,173,109713	21	B.Liu+	S0270

23 Vanadium

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	n,tot		CS	2ZZZGEL	2.0+01	8.0+05	Rept	EUR-28945	17	C.Paradela+	23774

24 Chromium 54

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	p,0		RP	1USATNL			Jour	NP/A,168,406	71	J.D.Moses+	C2705
	p,el	^{54}Cr	DA	1USATNL	2.6+09	2.6+09	Jour	NP/A,168,406	71	J.D.Moses+	C2705
	p,n	^{54}Mn	CS	1USATNL	2.6+09	2.6+09	Jour	NP/A,168,406	71	J.D.Moses+	C2705

27 Cobalt 59

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	^{6}He,non		CS	4ZZZDUB	1.5+08	1.9+08	Jour	IZV,84,1152	20	Yu.G.Sobolev+	F1453
*	^{9}Li,non		CS	4ZZZDUB	1.9+08	3.0+08	Jour	IZV,84,1152	20	Yu.G.Sobolev+	F1453

28 Nickel 64

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	p,0		RP	1USATNL			Jour	NP/A,168,406	71	J.D.Moses+	C2705
	p,el	^{64}Ni	DA	1USATNL	3.2+06	3.2+06	Jour	NP/A,168,406	71	J.D.Moses+	C2705
	p,n	^{64}Cu	CS	1USATNL	3.2+06	3.2+06	Jour	NP/A,168,406	71	J.D.Moses+	C2705

29 Copper

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	p,x	^{64}Cu	CS	3CPRIMP	1.4+07	1.8+07	Jour	ARI,173,109713	21	B.Liu+	S0270
*	p,x	^{62}Zn	CS	3CPRIMP	1.4+07	1.8+07	Jour	ARI,173,109713	21	B.Liu+	S0270
*	p,x	^{65}Zn	CS	3CPRIMP	9.2+06	1.8+07	Jour	ARI,173,109713	21	B.Liu+	S0270

31 Gallium 69

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	n,γ	^{70}Ga	CS	2ZZZGEL			Jour	PR/C,103,025802	21	K.Goebel+	23776
*	n,γ	^{70}Ga	?	2ZZZGEL			Jour	PR/C,103,025802	21	K.Goebel+	23776

31 Gallium 71

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	n,γ	^{72}Ga	CS	2ZZZGEL			Jour	PR/C,103,025802	21	K.Goebel+	23776
*	n,γ	^{72}Ga	?	2ZZZGEL			Jour	PR/C,103,025802	21	K.Goebel+	23776

36 Krypton 96

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	p,0		RP	1USATEX			Jour	PR/C,5,1641	72	C.L.Hollas+	C2690
	p,el	^{96}Kr	DA	1USATEX	4.7+06	1.0+07	Jour	PR/C,5,1641	72	C.L.Hollas+	C2690

39 Yttrium 89

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	^{63}Cu,x	^{148}Tb	TT	1USATAM	2.5+08	2.6+08	Jour	ARI,178,109935	21	J.T.Wilkinson+	C2693
*	^{63}Cu,x	^{149}Tb	TT	1USATAM	2.5+08	2.6+08	Jour	ARI,178,109935	21	J.T.Wilkinson+	C2693
*	^{63}Cu,x	^{150}Tb	TT	1USATAM	2.4+08	2.6+08	Jour	ARI,178,109935	21	J.T.Wilkinson+	C2693

42 Molybdenum 100

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	$t,^3$He	^{100}Nb	DAE	1USAMSU	3.4+08	3.4+08	Jour	PL/B,769,339	17	K.Miki+	C2266

48 Cadmium 110

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	p,0		RP	1USATEX			Jour	PR/C,1,1595	70	V.D.Mistry+	C2688
	p,el	^{110}Cd	DA	1USATEX	6.0+06	9.3+06	Jour	PR/C,1,1595	70	V.D.Mistry+	C2688

48 Cadmium 112

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	p,0		RP	1USATEX			Jour	PR/C,1,1595	70	V.D.Mistry+	C2688
	p,el	^{112}Cd	DA	1USATEX	6.5+06	1.1+07	Jour	PR/C,1,1595	70	V.D.Mistry+	C2688

48 Cadmium 114

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	p,0		RP	1USATEX			Jour	PR/C,1,1595	70	V.D.Mistry+	C2688
	p,el	^{114}Cd	DA	1USATEX	6.7+06	1.0+07	Jour	PR/C,1,1595	70	V.D.Mistry+	C2688

51 Antimony

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	p,x	^{111}In	CS	4RUSJIA	7.5+07	1.4+08	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{114}In	CS	4RUSJIA	5.2+07	1.4+08	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{113}Sn	CS	4RUSJIA	4.8+07	1.4+08	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{117}Sn	CS	4RUSJIA	1.8+07	1.4+08	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{117}Sn	TT	4RUSJIA	2.0+07	5.5+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{120}Sb	CS	4RUSJIA	1.8+07	1.4+08	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{122}Sb	CS	4RUSJIA	1.8+07	1.4+08	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{118}Te	CS	4RUSJIA	3.1+07	1.4+08	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{119}Te	CS	4RUSJIA	2.1+07	1.4+08	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{121}Te	CS	4RUSJIA	1.8+07	1.4+08	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{123}Te	CS	4RUSJIA	1.8+07	4.5+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461

51 Antimony 121

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	p,3n	^{119}Te	CS	4RUSJIA	2.3+07	8.8+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,4n	^{118}Te	CS	4RUSJIA	3.2+07	8.8+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,n	^{121}Te	CS	4RUSJIA	6.6+06	8.8+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{113}Sn	CS	4RUSJIA	4.8+07	8.8+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{117}Sn	CS	4RUSJIA	1.7+07	8.8+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{120}Sb	CS	4RUSJIA	2.0+07	8.4+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461

51 Antimony 123

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	p,3n	^{121}Te	CS	4RUSJIA	1.8+07	8.8+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,5n	^{119}Te	CS	4RUSJIA	3.6+07	8.8+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,6n	^{118}Te	CS	4RUSJIA	5.2+07	8.8+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461

*	p,n	^{123}Te	CS	4RUSJIA	3.3+07	4.0+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{113}Sn	CS	4RUSJIA	7.0+07	8.8+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{117}Sn	CS	4RUSJIA	2.4+07	8.8+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{117}Sn	TT	4RUSJIA	2.4+07	7.0+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{120}Sb	CS	4RUSJIA	2.6+07	8.8+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461
*	p,x	^{122}Sb	CS	4RUSJIA	3.3+07	8.8+07	Jour	RCA,108,327	20	S.V.Ermolaev+	F1461

52 Tellurium 123

	Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #
					Min	Max		Ref Vol Page			
	n,α	^{120}Sn	CS	4UKRIJD	2.4+04	2.4+04	Rept	JINR-P15-88-186	88	V.A.Vtyurin+	41396

52 Tellurium 130

	Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #
					Min	Max		Ref Vol Page			
	p,el	^{130}Te	DA	1USATEX	1.0+07	1.1+07	Jour	PR/C,3,905	71	H.R.Hiddleston+	C2689
	p,inel	^{130}Te	DAP	1USATEX	8.0+06	1.1+07	Jour	PR/C,3,905	71	H.R.Hiddleston+	C2689

63 Europium 151

	Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #
					Min	Max		Ref Vol Page			
*	α,6n	^{149}Tb	CS	4RUSKUR	5.3+04	6.0+04	Jour	NIM/B,497,59	21	A.N.Moiseeva+	F1456
*	α,x	^{150}Tb	CS	4RUSKUR	4.7+04	6.0+04	Jour	NIM/B,497,59	21	A.N.Moiseeva+	F1456
*	α,x	^{151}Tb	CS	4RUSKUR	3.7+04	6.0+04	Jour	NIM/B,497,59	21	A.N.Moiseeva+	F1456
*	α,x	^{152}Tb	CS	4RUSKUR	2.8+04	6.0+04	Jour	NIM/B,497,59	21	A.N.Moiseeva+	F1456
*	α,x	^{152}Tb	TT	4RUSKUR	3.4+07	4.2+07	Jour	NIM/B,497,59	21	A.N.Moiseeva+	F1456
*	α,x	^{153}Tb	CS	4RUSKUR	1.9+04	6.0+04	Jour	NIM/B,497,59	21	A.N.Moiseeva+	F1456

64 Gadolinium 160

	Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #
					Min	Max		Ref Vol Page			
*	p,n	^{160}Tb	CS	1USABRK	5.0+06	1.7+07	Jour	ARI,171,109647	21	R.K.Chapman+	C2692

68 Erbium

	Reaction	Product	Quant.	Lab.	Energy (eV)		Type	Documentation	Date	Author	Data #
					Min	Max		Ref Vol Page			
*	α,x	^{165}Tm	CS	4RUSKUR	1.7+07	5.9+07	Jour	ARI,177,109919	21	E.S.Kormazeva+	F1459
*	α,x	^{165}Tm	TT	4RUSKUR	4.0+07	6.0+07	Jour	ARI,177,109919	21	E.S.Kormazeva+	F1459
*	α,x	^{166}Tm	CS	4RUSKUR	2.5+07	5.9+07	Jour	ARI,177,109919	21	E.S.Kormazeva+	F1459
*	α,x	^{167}Tm	CS	4RUSKUR	1.1+07	5.9+07	Jour	ARI,177,109919	21	E.S.Kormazeva+	F1459
*	α,x	^{167}Tm	TT	4RUSKUR	3.0+07	6.0+07	Jour	ARI,177,109919	21	E.S.Kormazeva+	F1459

*	α,x	^{168}Tm	CS	4RUSKUR	2.5+07	5.9+07	Jour	ARI,177,109919	21	E.S.Kormazeva+	F1459
*	α,x	^{166}Yb	CS	4RUSKUR	2.1+07	5.9+07	Jour	ARI,177,109919	21	E.S.Kormazeva+	F1459
*	α,x	^{167}Yb	CS	4RUSKUR	3.7+07	5.9+07	Jour	ARI,177,109919	21	E.S.Kormazeva+	F1459
*	α,x	^{169}Yb	CS	4RUSKUR	1.7+07	5.9+07	Jour	ARI,177,109919	21	E.S.Kormazeva+	F1459
*	α,x	^{169}Yb	TT	4RUSKUR	2.0+07	6.0+07	Jour	ARI,177,109919	21	E.S.Kormazeva+	F1459

72 Hafnium 176

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	γ,x+n	inclusive	CS	4RUSSGU	9.0+06	2.0+07	Jour	YF,26,465	77	A.M.Goryachev+	M0007

72 Hafnium 178

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	γ,x+n	inclusive	CS	4RUSSGU	9.0+06	2.0+07	Jour	YF,26,465	77	A.M.Goryachev+	M0007

72 Hafnium 180

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	γ,x+n	inclusive	CS	4RUSSGU	9.0+06	2.0+07	Jour	YF,26,465	77	A.M.Goryachev+	M0007

73 Tantalum 181

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	^{6}He,non		CS	4ZZZDUB	1.5+08	1.8+08	Jour	IZV,84,1152	20	Yu.G.Sobolev+	F1453
*	^{8}He,non		CS	4ZZZDUB	1.3+08	1.7+08	Jour	IZV,84,1152	20	Yu.G.Sobolev+	F1453
*	^{9}Li,non		CS	4ZZZDUB	1.6+08	2.9+08	Jour	IZV,84,1152	20	Yu.G.Sobolev+	F1453
*	^{18}O,x	Many	DA	4ZZZDUB	1.8+08	1.8+08	Jour	YF,83,94	20	A.K.Azhibekov+	F1454

74 Tungsten 186

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	p,n	^{186}Re	TT	4RUSKUR	1.5+07	1.5+07	Jour	AE,128,151	20	V.A.Zagryadskii+	F1463
*	d,2n	^{186}Re	TT	4RUSKUR	1.9+07	1.9+07	Jour	AE,128,151	20	V.A.Zagryadskii+	F1463
*	^{3}He,p	^{188}Re	TT	4RUSKUR	2.5+07	2.5+07	Jour	AE,128,151	20	V.A.Zagryadskii+	F1463
*	^{3}He,x	^{186}Re	TT	4RUSKUR	2.5+07	2.5+07	Jour	AE,128,151	20	V.A.Zagryadskii+	F1463
*	α,p	^{189}Re	TT	4RUSKUR	4.7+07	4.7+07	Jour	AE,128,151	20	V.A.Zagryadskii+	F1463
*	α,x	^{186}Re	TT	4RUSKUR	4.7+07	4.7+07	Jour	AE,128,151	20	V.A.Zagryadskii+	F1463
*	α,x	^{188}Re	TT	4RUSKUR	4.7+07	4.7+07	Jour	AE,128,151	20	V.A.Zagryadskii+	F1463

75 Rhenium 185

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	n,γ	^{186}Re	?	1USALAS	2.4+05	2.4+05	Rept	LA-16	43	G.A.Linenberger+	14722

75 Rhenium 187

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	n,γ	^{188}Re	?	1USALAS	2.4+05	2.4+05	Rept	LA-16	43	G.A.Linenberger+	14722

79 Gold 197

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	n,γ	^{198}Au	?	1USALAS	2.4+05	2.4+05	Rept	LA-16	43	G.A.Linenberger+	14722

82 Lead

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	p,x	^{194}Hg	CS	4RUSITE	1.5+08	2.6+09	Jour	NIM/A,1026,166151	22	Yu.E.Titarenko+	F1462
*	p,x	^{207}Bi	CS	4RUSITE	3.8+07	4.0+08	Jour	NIM/A,1026,166151	22	Yu.E.Titarenko+	F1462
	^{7}Li,x	Many	CS	4ZZZDUB	2.4+08	2.4+08	Jour	PAN,68,21	05	N.A.Demekhina+	A0486

82 Lead 206

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	p,x	^{194}Hg	CS	4RUSITE	1.0+08	2.6+09	Jour	NIM/A,1026,166151	22	Yu.E.Titarenko+	F1462

82 Lead 207

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	p,x	^{194}Hg	CS	4RUSITE	1.5+08	2.6+09	Jour	NIM/A,1026,166151	22	Yu.E.Titarenko+	F1462

82 Lead 208

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	p,0		RP	1USATEX			Thes	KULLECK	70	J.G.Kulleck+	C2700

	p,el	^{208}Pb	DA	1USATEX	1.4+07	1.8+07	Thes	KULLECK	70	J.G.Kulleck+	C2700
	p,inel	^{208}Pb	DAP	1USATEX	1.4+07	1.8+07	Thes	KULLECK	70	J.G.Kulleck+	C2700
	p,inel	^{208}Pb	DAP	1USALAS	1.5+07	1.7+07	Thes	KULLECK	70	J.G.Kulleck+	C2700
	p,inel	^{208}Pb	DAP	1USATEX	1.5+07	1.8+07	Thes	KULLECK	70	J.G.Kulleck+	C2700
	p,inel	^{208}Pb	DAP	1USAWAU	1.6+07	1.6+07	Thes	KULLECK	70	J.G.Kulleck+	C2700
	p,inel	^{208}Pb	DAP	1USATEX	1.6+07	1.6+07	Thes	KULLECK	70	J.G.Kulleck+	C2700
*	p,x	^{194}Hg	CS	4RUSITE	2.5+08	2.6+09	Jour	NIM/A,1026,166151	22	Yu.E.Titarenko+	F1462
*	^{9}Li,inel	^{208}Pb	DAP	3CPRIMP	3.3+07	3.3+07	Jour	PR/C,103,L061302	21	W.H.Ma+	S0273
*	^{11}Be,sct	^{208}Pb	DA	3CPRIMP	1.4+08	1.4+08	Jour	PL/B,811,135942	20	F.F.Duan+	S0235
*	^{11}Be,x	^{10}Be	DA	3CPRIMP	1.4+08	1.4+08	Jour	PL/B,811,135942	20	F.F.Duan+	S0235

83 Bismuth 209

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	n,γ	^{210}Bi	CS	2GERFRK			Jour	PR/C,103,065805	21	K.Al-Khasawneh+	23778
*	n,γ	^{210}Bi	CS	2GERMUN	2.5-02	2.5-02	Jour	PR/C,103,065805	21	K.Al-Khasawneh+	23778
*	n,γ	^{210}Bi	CS	2GERFRK	Maxwl		Jour	PR/C,103,065805	21	K.Al-Khasawneh+	23778
*	n,γ	^{210}Bi	RI	2GERMUN		5.5-01	Jour	PR/C,103,065805	21	K.Al-Khasawneh+	23778
*	p,x	^{194}Hg	CS	4RUSITE	1.5+08	2.6+09	Jour	NIM/A,1026,166151	22	Yu.E.Titarenko+	F1462
*	^{40}Ar,5n	^{244}Md	CS	1USABRK	2.2+08	2.2+08	Jour	PRL,124,252502	20	J.L.Pore+	C2685

92 Uranium

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
0,fis		NU	1USALAS	Spont		Rept	LA-86	44	O.Chamberlain+	14730

92 Uranium 233

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
n,fis	Many	FY	4RUSKUR	Fiss	1.4+07	Jour	AE,10,13	61	E.K.Bonyushkan+	41070

92 Uranium 235

Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
n,0		RP	1USALAS			Rept	LA-82	44	E.E.Anderson+	14728
n,fis		MFQ	1USAMIN	2.5-02	2.5-02	Rept	LA-60	44	H.T.Richards+	14727
n,fis		MFQ	1USALAS	2.5-02	2.5-02	Rept	LA-84	44	H.T.Richards+	14729
n,fis		?	1USALAS	1.0-02	9.7+02	Rept	LA-82	44	E.E.Anderson+	14728
n,fis		?	1USALAS	2.5+06	3.0+06	Rept	LA-163	44	H.M.Agnew+	14731
n,fis		?	1USALAS	2.5-02	2.5-02	Rept	LA-17	43	F.Bloch+	14725
n,fis	n	KE	1USAMIN	2.5-02	2.5-02	Rept	LA-60	44	H.T.Richards+	14727
n,fis	n	KE	1USALAS	2.5-02	2.5-02	Rept	LA-84	44	H.T.Richards+	14729
n,tot		CS	1USALAS	2.5-02	2.5-02	Rept	LA-82	44	E.E.Anderson+	14728

92 Uranium 238

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
	n,fis		CS	1USALAS	2.5+06	3.0+06	Rept	LA-163	44	H.M.Agnew+	14731
	n,γ	^{239}U	?	1USALAS	2.4+05	2.4+05	Rept	LA-16	43	G.A.Linenberger+	14722
*	n,inel	^{238}U	DAP	2ZZZGEL	1.0+06	1.3+07	Jour	PR/C,104,044605	21	M.Kerveno+	22795
*	^{9}Be,5n	^{242}Cm	CS	3CPRIMP	4.3+07	6.3+07	Jour	CNPR,34,138	17	Hua Wei+	S0249

94 Plutonium 239

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	n,2n	^{238}Pu	CS	2FR CAD	7.1+06	9.3+06	Jour	PR/C,103,054609	21	V.Meot+	23777
	n,fis	Many	FY	4RUSKUR	Fiss	1.4+07	Jour	AE,10,13	61	E.K.Bonyushkan+	41070
*	n,fis	Many	FY	2FR ILL	Maxwl		Jour	PR/C,104,034621	21	S.Dubey+	23780
	n,fis		MFQ	1USALAS	2.5-02	2.5-02	Rept	LA-84	44	H.T.Richards+	14729
	n,fis		?	1USALAS	2.5+06	3.0+06	Rept	LA-163	44	H.M.Agnew+	14731
	n,fis		?	1USALAS	2.5-02	2.5-02	Rept	LA-25	43	C.L.Bailey+	14723

94 Plutonium 241

	Reaction	Product	Quant.	Lab.	Energy (eV) Min	Energy (eV) Max	Type	Documentation Ref Vol Page	Date	Author	Data #
*	n,fis	Many	FY	2FR ILL	Maxwl		Jour	PR/C,104,034621	21	S.Dubey+	23780
*	n,fis	Many	FY	2FR ILL	Maxwl		Jour	PR/C,102,034602	20	S.Julien-Laferriere+	23781