INTERNATIONAL ATOMIC ENERGY AGENCY

NUCLEAR DATA SERVICES

DOCUMENTATION SERIES OF THE IAEA NUCLEAR DATA

IAEA-NDS-90
Rev. 8 January 1994

BROND-2.2

Russian Evaluated Neutron Reaction Data Library

by V.N. Manokhin et al.

Библиотека рекомендованных оценённых
нейтронных данных (БРОНД-2.2)

Abstract: BROND-2, the computerised data library for evaluated neutron reaction data of the Russian Federation was released in 1992 and updated in 1993 as BROND-2.2. Its content is summarised in this document. Upon request it is available on CD-ROM or magnetic tape, cost free, from the IAEA Nuclear Data Section. It is also available within the IAEA online system NDIS.

Summary documentation by

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IAEA-NDS-reports are updated whenever there is additional information of relevance to the users of the data library.

For citations care should be taken that credit is given to the author of the data library and/or to the data center which issued the data library. The editor of the IAEA-NDS-report is usually not the author of the data library.

Neither the originator of the data libraries nor the IAEA assume any liability for their correctness or for any damages resulting from their use.

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Citation guidelines:

BROND-2.2

Russian Evaluated Neutron Reaction Data Library

BROND-2

Russian evaluated neutron reaction data library

Introduction by the Russian Nuclear Data Center

This is the 1990-1991 version of the BROND-2 library. It was compiled, checked and released by the Centr po Jadernym Dannym (CJD) at the Fiziko-Energeticheskij Institut (FEI), Obninsk.

For 121 materials from 1-H-1 to 96-Cm-244 all relevant cross-sections and differential data of all relevant neutron-induced reactions are given in the energy range 1.0E-5 eV to 20 MeV. The BROND-2 library is in ENDF-6 format and has N-LIB=41 for identifying the library. On the following pages the materials included in the BROND-2 File are listed.

The BROND-2 Library is now available in two versions:

- the original version contains data in the form of resonance parameters and has about 275000 records;

- in the derived version BROND-2R the resonance parameters have been converted by the codes "Linear+Recent" to pointwise cross-sections as functions of energy at a temperature of 0°K.

A complete summary description of the evaluations in the BROND-2 Library is given in the following publications:

- A.I. Blokhin, A.V. Ignatjuk, V.N. Manokhin, M.N. Nikolaev, V.G. Pronjaev (editors): BROND-2, Library of recommended evaluated neutron data, documentation of data files. In: Yadernye Konstanty, 1991, issues 2+3, in English.

- A.I. Blokhin, A.V. Ignatjuk, B.D. Kuzminov, V.N. Koshcheev, V.N. Manokhin, G.N. Manturov, M.N. Nikolaev. The Library of the evaluated neutron data files. Int. Conf. "Nuclear Data for Science and Technology", 13-17 May 1991, Jülich, Germany; Proceedings (1992) p. 800-803.

The Evaluation Group of the CJD hopes for wide application of the BROND-2 Library in various fields of nuclear technology and welcomes any comments and suggestions to improve the nuclear data from BROND-2.

All comments should be sent to

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The version BROND-2.1 contains various formal corrections without changing the physics data information. The corrections were made to satisfy the requirements for the 91 version of the NJOY code. In Sept./Nov. 1993 additional corrections were included in the version BROND-2.2.

Table 1. Content of BROND-2 Library

S - A	MAT	LAB	AUTHOR	DATE	NR
H - 1	101	FEI	DODDER, L.STEWART,G.HALE	DEC70	646
H - 2	102	FEI	NIKOLAEV M.N.	DEC88	570
H - 3	**103**	FEI	NIKOLAEV M.N.	DEC88	282
HE- 3	203	FEI	NIKOLAEV M.N.	DEC88	**579**
HE- 4	204	FEI	NIKOLAEL,ABAGJAN,BAZAZJANTS	JAN76	378
LI- 6	306	CJD-FEI	NIKOLAEV M.N.	JAN89	2153
LI- 7	307	CJD-FEI	BONDARENKO I.M.	MAY84	1705
C — O	600	ORNL	C.Y.FU, E.J.AXTON AND F.G.PEREY	AUG89	3515
N - 14	710	CJD-FEI	A.I.BLOKHIN, N.S.RABOTNOV	NOV88	5968
N - 15	720	CJD	A.I.BLOKBIN, N.S.RABOTNOV	APR89	4292
O - 16	816	FEI	M.N.NIKOLAEV ET AL.	AUG77	5659
F - 19	919	FEI	BLORHIN A.I.,RABOTNOV N.S.	NOV90	4682
NA- 23	1123	FEI	M.N.NIKOLAEV,V.N.KOSCHEEY ET.AL.	1978	1555
SI- O	1402	FUD/CJD	HERMSDQRF,BLOKHIN.IGNATYUK A.	MAY85	6777
P - 31	1531	FEI	V.N.KOSCHEEV	MAY89	1137
CL- O	1700	FEI	M.N.NIKOLAEV ET.AL.	FEB90	4602
CR- O	2401	CJD-FEI	SEE LIST BELOW	APR84	6455
CR- 50	2450	CJD-FEI	A.I.BLOKHIN, A.V.IGNATYUK ET AL.	NOV87	3377
CR- 52	2452	CJD-FEI	A.I.BLOKHIN,A.V.IGNATYUK ET AL.	OCT87	3779
CR- 53	2453	CJD-FEI	A.I.BLOKHIN,A.V.IGNATYUK ET AL.	NOV87	1440
CR- 54	2454	CJD-FEI	A.I.BLOKHIN,A.V.IGNATYUK ET AL.	OCT87	3398
FE- O	2601	CJD-FEI	PRINCIP. EVAL. V.G.PRONYAEV +	NOV85	7078
FE- 54	2611	CJD-FEI	V.G.PRONYAEV + SEE FREE TEXT	NOV85	1282
FE- 56	2621	CJD-FEI	V.G.PRONYAEY + SEE FREE TEXT	NOV85	3393
FE- 57	2631	CJD-FEJ	*V.G.PRONYA£V* + SEE FREE TEXT	NOV85	1272
FE- 58	2641	CJD-FEl	V.G.PRORYAEV + SEE FREE TEXT	NOV85	769
NI- O	2801	CJD-FEI	A.I.BLOKHIN,A.V.IGNATYUK ET.AL.	DEC84	4448
NI- 58	2811	CJD-FEI	A.I.BLOKHIN,A.V.IGNATYUK+	MAY85	3724
NI- 60	2821	CJD-FEI	A.I.BLOKHIN,A.V.IGNATJUK	MAY85	3667
NI- 61	2831	CJD-FEI	A.I.BLORHIN,A.V.IGNATYUK+	MAY85	3759
NI- 62	2841	CJD-FEI	A.I.BLOKHIN,A.V.IGNATYVK+	MAY85	3495
NI- 64	2851	CJD-FEI	A.I.BLOKHIN,A.V.IGNATYUE	MAY85	3337
CU- O	2900	FEI	NIKOLAEV M.N. ET.AL.	MAY81	3430
ZN- O	3000	FEI	NIKOLAEV M.N.AND ZABRODSKAJA S.V.	DEC89	4262
SR - 90	3890	FEl	GRUDZEVICH,ZELENETSKY	OCT90	891
ZR- O	4000	CJD-FEI	GRUDZEVICH O.T.,ZELENETSKIJ A.V.	DEC88	4232
ZR- 90	4090	CJD-FEI	GRUDZEVICH O.T. ET. AL.	DEC88	2217
ZR- 91	4091	CJD-FEI	GRUDZEVICH O.T. ET. AL.	DEC88	2795
ZR- 92	4092	CJD-FEI	GRUDZEVICR O.T. ET. AL.	DEC88	1809
ZR- 93	4093	CJD	GRUDZEVICH,ZELENETSKIJ	DEC89	1391
ZR- 94	4094	CJD-FEI	GRUDZEVICH O.T. ET. AL.	DEC88	1751
ZR- 95	4095	CJD	GRUDZEVICH,ZELENETSKIJ	DEC89	809
ZR- 96	4096	CJD-FEI	GRUDZEVICH O.T. ET. AL.	DEC88	1018
NB- 93	4193	CJD-FEI	PRINCAP. EVAL V.G.PRONYAEV+	DEC88	5235
NB- 95	4195	FEI	GRUDZEVICH,ZELENETSKY	DEC90	852
TC- 99	4399	CJD	IGNATYUK A.V.,KRAVCHENKO I.V.	AUG84	1073
RU-101	4401	CJD	IGNATYUK A.V.,KRAVCHENKO I.V.	DEC84	953
RU-102	4402	CJD	IGNATYUK A.V.,KRAVCHENKO I.V.	NOV84	797
RU-104	4404	CJD	IGNATYUK A.V.,KRAVCHESKO I.V.	DEC84	597
RU-106	4406	CJD	IGNATYUK A.V.,KRAVCHENKO I.V.	NOV85	527
RH-103	4503	CJD-FEI	IGNATYUK A.v.,KRAVCHENKO I.V.	AUG85	990
PD-105	4605	CJD	IGNATYUK A.V.,KRAVCHENKO I.V.	JUL84	992
PD-106	4606	CJD	BELANOVA T.S.,IGNATYUK A.V.	SEP87	574
PD-107	4607	CJD	IGNATYUK A.V.,KRAVCHENKO I.V.	NOV85	923
PD-108	4608	CJD	BELANOVA T.S.,IGNATYUK A.V.	SEP87	575
AG-109	4709	CJD-FEI	IGNATYUK A.V.,KRAVCHENKO I.V.	JUL85	839
SN- O	5000	CJD-FEI	PRINCIP.EVAL. V.G.PRONYAEV+	APR90	3926
I-129	5329	CJD	IGNATYUK A.V.,KRAVCHENKO I.V.	SEP85	1116
XE-131	5431	CJD	IGNATYUK A.V.,KRAVCHENKO I.V.	NOV85	999
CS-135	5535	CJD	IGNATYUK A.V.,KRAVCHENKO I.V.	DEC85	538

Table 1. Content of BROND-2 Library (cont.)

CE-140	5840	CJD	IGNATYUK A.V., ULAEVA M.V.	DEC90	971
CE-142	5842	CJD	IGNATYUK A.V.,ULAEVA M.V.	DEC90	621
CE-144	5844	CJD	IGNATYUK A.V.,KRAVCHENKO I.V.	DEC85	435
ND-143	6043	CJD	IGNATYUK A.V.,KRAVCHENKO I.V.	SEP85	924
ND-145	6045	CJD	IGNATYUK A.V.,KRAVCHENKO I.V.	SEP85	869
PM-147	6147	CJD	IGNATYUK A.V.,KRAVCHENKO I.V.	AUG85	955
SM- O	6200	CJD-FEI	IGNATYUK A.V. ET. AL.	DEC89	3095
SM-144	6244	CJD-FEI	IGNATYUK A.V., ULAEVA M.V.	DEC89	444
SM-147	6247	CJD-FEI	IGNATYUK A.V.,KRAVCHENKO I.V.	JUN85	1260
SM-148	6248	CJD-FEI	ZAKHAROVA S.M.,IGNATYUK A.V.	SEP87	934
SM-149	6249	CJD-FEI	IGNATYIUK A.V.,KRAVCHENKO I.V.	MtY85	1209
SM-150	6250	CJD-FEI	ZAKHAROVA S.M.,IGNATYUK A.V.	SEP87	904
SM-151	6251	CJD-FEI	IGNATYUK A.V.,KRAVCHENKO I.V.	JUN85	1150
SM-152	6252	CJD-FEI	BELANOVA,ZAKHAROVA,IGNATYUK	AUG87	939
SM-154	6254	CJD-FEI	BELANOVA,ZAKHAROVA,IGNATYUK	DEC89	904
EU-153	6353	CJD-FEI	IGNATYUK A.V.,KRAVCHENEO I.V.	DEC85	2524
GD- O	6400	FEI-CJD	A.I.BLOKHIN	NOV89	3305
GD-152	6452	FEI-CJD	A.I.BLOKHIN	aOv89	1609
GD-154	6454	FEI-CJD	A.I.BLOKHIN	NOV89	1607
GD-155	6455	FEI-CJD	A.I.BLOKHIN	NOV89	1738
GD-156	6456	FEI-CJD	A.I.BLOKHIN	NOV89	1551
GD-157	6457	FEI-CJD	A.I.BLORHIN	NOV89	1611
GD-158	6458	FEI-CJD	A.I.BLOKHIN	NOV89	1522
GD-160	6460	FEI-CJD	A.I.BLOKHIN	NOV89	1304
ER-162	6862	FEI	S.M.ZAKHAROVA ET.AL	DEC76	1139
ER-164	6864	FEI	S.M.ZAKHAROVA ET.AL.	DEC76	1163
ER-166	6866	FEI	S.M.ZAKHAROVA ET.AL	DEC76	1267
ER-167	6867	FEI	S.M.ZAKHAROVA ET.AL	DEC76	1502
ER-168	6868	FEI	S.M.ZAKHAROVA ET.AL	DEC76	1400
ER-170	6870	FEI	S.M.ZAKHAROVA ET.AL	DEC76	1357
TA-181	7381	FEI	MANTUROV G.N.,KORCHAGINA J.A.	MAY88	2878
W -182	7482	FEI	ABAGYAN L.P.,MANTUROV G.N.	MAY83	3110
W -183	7483	FEI	ABAGYAN L.P., MANTUROV G.N.	MAY83	3560
W -184	7484	FEI	ABAGYAN L.P., MANTUROV G.N.	MAY83	3020
W -186	7486	FEI	ABAGYAN L.P., MANTUROV G.N.	MAY83	2945
RE- O	7500	FEI	NIKOLAEV M.N. ET.AL.	JAN88	1338
OS- O	7600	FEI	NIKOLAEV M.N.	JAN90	2295
IR- O	7700	FEI	NIKOLAEV M.N.,ZABRODSKAJA S.V.	JAN90	2574
AU-197	7925	LANL	P.G.YOUNG	JAN84	6427
PB- O	8202	TUD-FEI	D.HERMSDORF,A.BLOKHIN,A.IGNATYUR	MAY84	4704
PB-204	8211	FEI-CJD	A.I.BLOKHIN ET.AL.	DEC90	2655
PB-206	8212	FEI-CJD	A.I.BLOKHIN ET.AL	DEC90	3189
PB-207	8213	FEI-CJD	A.I.BLOKHIN ET.AL.	DEC90	2416
PB-208	8214	FEI-CJD	A.I.BLOKHIN ET.AL.	DEC90	1956
BI-209	8301	CJD	BLOKHIN A.I. ET AL.	NOV90	3568
TH-232	9032	FEI	M.N.NIKOLAEV ET.AL.	NOV83	1526
U -233	9211	IJE	SUKHOVITSKIJ, KLEPATSKIJ	MAR90	3014
U -235	9241	IJE	KON'SHIN,SUKHOVITSKIJ,ANTSIPOV	APR85	2490
U -236	9251	IJE	KON'SHIN,SUKHOVITSKIJ,KLEPATSKIJ	FEB86	1719
U -238	9261	FEI	NIKOLAEV M.N.	JAN80	2020
PU-238	9411	IJE	SUKHOVITSKIJ E.,KLEPATSKIJ A.	FEB87	1468
PU-239	9421	TMO	KON'SHIN,SUKHOVITSKIJ,ANTSIPOV	SEP80	2258
PU-240	9431	TMO	KON'SHIN,SUKHOVITSKIJ,ANTSIPOV	DEC80	1778
PU-241	9441	TMO	KON'SHIN,SUKHOVITSKII,ANTSIPOV	FEB79	2142
PU-242	9451	TMO	KON'SHIN,SUKHOVITSKIJ,ANTSIPOV	DEC80	1565
AM-241	9541	FEI+IJE	A.I.BLOKHIN, V.M.MASLOV	OCT90	3283
AM-242	9542	FEI+IJE	A.I.BLOKHIN, V.M.MASLOV	OCT90	1476
AM-242M	9543	FEI+IJE	A.I.BLOKHIN, V.M.MASLOV	OCT90	2849
AM-243	9544	FEI+IJE	A.I.BLOKHIN, V.M.MASLOV	OCT90	3280
CM-242	9611	IJE	SUKHOVITSKIJ,KLEPATSKIJ	DEC87	1108
CM-244	9631	IJE	SUKHOVITSKIJ,KLEPATSKIJ	DEC88	1315

BROND-2

Russian evaluated neutron data library

Introduction by IAEA Nuclear Data Section

The characters BROND stand for Biblioteka Rekomendovannykh Ocenennykh Nejtronnykh Dannykh (= Library of Recommended Evaluated Neutron Data).

The first version of BROND was issued in 1986. It was documented in the unnumbered report "Biblioteka rekomendovannykh ocenennykh nejtronnykh dannykh (BROND)" by V.N. Manokhin (ed.), Centr po Jadernykh Dannykh, Obninsk 1986, in Russian. Retroactively, this report was assigned the number INDC(CCP)-261.

The release of this computerized data library by the Russian Centr po Jadernym Dannym (CJD, Nuclear Data Center) at Obninsk, Russia, under V.N. Manokhin is gratefully acknowledged.

Whereas most of the evaluations were performed at Obninsk, some evaluations were contributed from the Nuclear Power Institute at Minsk (V.A. Konshin) and from the Technical University Dresden, German Democratic Republic (D. Hermsdorf).

Most of the evaluations were performed around the years 1984/1985. They were tested, checked and subsequently released in 1987/1988. Additional evaluations were performed in 1989/1991, and revisions to earlier evaluations were made to be included in BROND-2 which was released in 1992. There is no restriction in the distribution.

In 1993/1994 revisions were received for the nuclides 1-D-2, 7-N-14,15, 14-Si, 40-Zr-90,91,92,94,96, 41-Nb-93, 50-Sn. (Nb and Sn by V. Pronjaev, the others by A. Blokhin). The evaluations for these nuclides represent the BROND-contribution to FENDL, the international evaluated nuclear data library for fusion applications. These evaluations were included in the present version BROND-2.2. The revised files are labelled with "DIST-OCT93 REVI-SEP93" or "Nov 93" in cases of Nb and Sn. The new files for the Zr isotopes include now gamma-production data. For the other revised files the revisions were required for the data processing with the NJOY code.

The format of the data in BROND-2 is the international format ENDF-6 which is documented in the report IAEA-NDS-76 Rev. 4.

The library BROND-2.2 reported in this document supersedes the earlier versions BROND-1 and BROND-2, "BROND-NDS1" plus three supplements "BROND-NDS2", "BROND-NDS3", "BROND-NDS4". BROND-1 had been documented by V.N. Manokhin in the book: Library of recommended evaluated neutron data (BROND), Obninsk, 1986, in Russian. An English translation of this book is available from the IAEA Nuclear Data Section as report INDC(CCP)-283, IAEA, Vienna, 1988. Copies of the BROND-2 documentation in "Yadernye Konstanty" (1991) are also available from the IAEA Nuclear Data Section.

The present BROND-2.2 library is available within the IAEA online system NDIS, which is explained in the document IAEA-NDS-150. Upon request it is also available on magnetic tape. The size of the basic library is 265 544 records, i.e. 21 Megabytes. Also available is a "point data" version where resonance parameters have been converted to cross-sections.

Identical tape copies are available also from the USA National Nuclear Data Center at Brookhaven and from the OECD/NEA Nuclear Data Bank at Saclay.

Appended to this document is a listing of thermal and 14 MeV cross- sections and of selected spectrum averaged cross-sections derived from BROND-2 with the code INTER version 6.7. This listing was provided by CJD.

BROND-2

Russian recommended evaluated neutron reaction data library

BROND MAT Nr.	nuclide	origin	# of records
		Light elements	
101	1-H-1	Nikolaev, Obninsk revisions 1988/1990 to ENDF/B-5-1301 (LASL. Includes γ-production data. Revision of MAT 111 in BROND-NDS1.	646
102	1-D-2	M.N. Nikolaev Dec. 1988, revisions to earlier Obninsk evaluation. Small corrections 1990. Includes γ-production data. Revision of MAT 121 in BROND-NDS1. BROND-2.2: Small corrections Sept. 93.	573
103	1-T-3	Obninsk Dec. 1988	282
203	2-He-3	Obninsk Dec. 1988 Earlier evaluation by M.N. Nikolaev (1977) thoroughly revised. Replaces MAT 211 in BROND-NDS1.	579
204	2-He-4	Obninsk 1989/1990 Earlier evaluation by M.N. Nikolaev (1976) revised because of new experimental data.	378
306	3-Li-6	Nikolaev, Bondarenko 1989/1992 Revision of MAT 361 in BROND-NDS1.	2153
307	3-Li-7	Bondarenko 1985/1992. Revision of MAT 371 in BROND-NDS1.	1705
601	6-C-nat	ENDF/B-6: C.Y. Fu, F.G. Perey Identical with ENDF/B-6 Rev. 1.	3515

BROND MAT Nr.	nuclide	origin	# of records
710	7-N-14	A.I. Blokhin et al., Nov. 1988, YK 1989/4 p. 12. BROND-2.2: Revisions in Sept. 1993.	6103
720	7-N-15	A.I. Blokhin et al., April 1988, INDC(CCP)-313. Includes γ-production data. BROND-2.2: Revisions in Sept. 1993.	4917
816	8-O-nat	M.N. Nikolaev et al., 1977, revised 1990. Above 3 MeV data from ENDF/B-4, LASL, Young 1973. Includes γ-production data. Revision of MAT 801 in BROND-NDS1.	5659
919	9-F-19	Blokhin, Rabotnov 1990 New in BROND-2. Includes γ-production data.	4682
1123	11-Na-23	M.N. Nikolaev et al.,1978, revised 1990. Revision of MAT 1111 in BROND-NDS1.	1555
1402	14-Si-nat	Dresden + Obninsk Based on D. Hermsdorf's evaluation in report INDC(GDR)-38 (Aug. 1986) and supplemented by A.I. Blokhin and A. Ignatjuk. In 1992 converted to ENDF-6 format. Includes γ-production data. BROND-2.2: Revisions in Sept. 1993	6777
1531	15-P-31	V.N. Koscheev 1989/1990 New in BROND-2.	1137
1700	17-Cl-nat	Nikolaev 1990 New in BROND-2.	4602

BROND MAT Nr.	nuclide	origin	# of records
		Structural materials	
2401	24-Cr-nat	Blokhin et al., 1984 Thoroughly revised by Pronjaev in 1989/1991. Includes γ-production data. Revision of MAT 2400 in BROND-NDS1.	6455
Note: This evaluation for the natural element is not the sum of the following isotopic evaluations.			
2450	24-Cr-50	Obninsk, Apr. 1984, revised 1990, Blokhin et al. Revision of MAT 2411 in BROND-NDS1 and of MAT 2425 in BROND-NDS2.	3377
2452	24-Cr-52	Obninsk, Apr. 1984, revised 1990, Blokhin et al. Revision of MAT 2421 in BROND-NDS1 and of MAT 2431 in BROND-NDS2.	3779
2453	24-Cr-53	Obninsk, Apr. 1984, revised 1990, Blokhin et al. Revision of MAT 2431 in BROND-NDS1 and of MAT 2453 in BROND-NDS2.	1440
2454	24-Cr-54	Obninsk, Apr. 1984, revised 1990, Blokhin et al. Revision of MAT 2437 in BROND-NDS2.	3398
2601	26-Fe-nat	Pronjaev et al., 1985, revised 1988/90. Includes γ-production data. This evaluation for the natural element is the sum of the following isotopic evaluations. However, γ-production data have been included only for the natural element.	7078
2611	26-Fe-54	Obninsk, Pronjaev et al., 1985, revised 1990.	1282
2621	26-Fe-56	"	3393
2631	26-Fe-57	"	1272
2641	26-Fe-58	"	769

BROND MAT Nr.	nuclide	origin	# of records
2801	28-Ni-nat	Obninsk, Blokhin et al., 1984 Includes γ-production data.	4448
Note: This evaluation for the natural element is the sum of the following isotopic evaluations. However, γ-production data have been included only for the natural element.			
2811	28-Ni-58	Obninsk, Blokhin et al., 1984	3724
2821	28-Ni-60	"	3667
2831	28-Ni-61	"	3759
2841	28-Ni-62	"	3495
2851	28-Ni-64	"	3337
Note: For the resonance parameters each isotope is represented as the sum of two pseudoisotopes, one for s-waves, the other for p- and d-wave resonances.			
2900	29-Cu-nat	Nikolaev et al., 1981/1991 Includes γ-production data.	3430

BROND MAT Nr.	nuclide	origin	# of records
		Medium elements	
3000	30-Zn-nat	M.N. Nikolaev et al., 1989/1991	4262
Note: The introductory text mentions data for separate isotopes in MAT 3064, 3066, 3067, 3068, 3069 which, however, were not received at IAEA.			
3890	38-Sr-90	Grudzevich et al., 1990 New in BROND-2.	891
4000	40-Zr-nat	Grudzevich et al., Dec. 1988 Inst. Atomnoi Energetiki, Obninsk	4232
4090	40-Zr-90	"	4179
4091	40-Zr-91	"	5108
4092	40-Zr-92	"	3720
4093	40-Zr-93	"	1391
4094	40-Zr-94	"	3429
4095	40-Zr-95	"	809
4096	40-Zr-96	"	2789
The file for the natural element includes γ-production data, which were originally not included in the isotopic files. BROND-2.2: In Sept. 1993 γ-production data have been added for the stable isotopes 90, 91, 92, 94, 96.			
4193	41-Nb-93	V.G. Pronjaev et al., Obninsk, H. Kalka et al., Dresden. 1988, revised 1990. Includes γ-production data. Replaces MAT nr. 4111 in BROND-NDS1. BROND-2.2: In Nov. 1993 modifications were made required for the NJOY processing.	4155
4195	41-Nb-95	Grudzevich et al., 1990 New in BROND-2.	852

BROND MAT Nr.	nuclide	origin	# of records
4399	43-Tc-99	Ignatjuk et al., 1984 Replaces MAT nr. 4311 in BROND-NDS1.	1073
4401	41-Ru-101	Ignatjuk et al., 1984 Replaces MAT nr. 4401 in BROND-NDS1.	953
4402	44-Ru-102	Ignatjuk et al., 1984 Replaces MAT nr. 4402 in BROND-NDS1.	797
4404	44-Ru-104	Ignatjuk et al., 1984 Replaces MAT nr. 4441 in BROND-NDS1.	597
4406	44-Ru-106	Ignatjuk et al., 1985 Replaces MAT nr. 4461 in BROND-NDS1.	527
4503	45-Rh-103	Ignatjuk et al., 1985 Replaces MAT nr. 4501 in BROND-NDS1.	990
4605	46-Pd-105	Ignatjuk et al., 1984 Replaces MAT nr. 4611 in BROND-NDS1.	992
4606	46-Pd-106	Ignatjuk et al., 1987 New in BROND-2.	574
4607	46-Pd-107	Ignatjuk et al., 1985 Replaces MAT nr. 4621 in BROND-NDS1.	923
4608	46-Pd-108	Ignatjuk et al., 1987 New in BROND-2.	575
4709	47-Ag-109	Ignatjuk et al., 1985 Replaces MAT nr. 4711 in BROND-NDS1.	839
5000	50-Sn-nat	V.G. Pronjaev et al., 1990 Includes γ-production data. BROND-2.2: In Nov. 1993 modifications were made required for the NJOY processing.	3878

BROND MAT Nr.	nuclide	origin	# of records
5329	53-I-129	Ignatjuk et al., 1985 Replaces MAT nr. 5391 in BROND-NDS1	1116
5431	54-Xe-131	Ignatjuk et al., 1985 Replaces MAT nr. 5411 in BROND-NDS1	999
5535	55-Cs-135	Ignatjuk et al., 1985, partly based on JENDL-1. New in BROND-2; BROND-1 had included data for Cs-133 and Cs-135 taken over from JENDL-2.	538
5840	58-Ce-140	Ignatjuk et al., 1990 New in BROND-2.	971
5842	58-Ce-142	Ignatjuk et al., 1990 New in BROND-2.	621
5844	58-Ce-144	Ignatjuk et al., 1985 Replaces MAT nr. 5841 in BROND-NDS1	435
Note: The Ce files are partly based on JENDL-1.			

BROND MAT Nr.	nuclide	origin	# of records
6043	60-Nd-143	Ignatjuk et al., 1985 Replaces MAT nr. 6031 in BROND-NDS1	924
6045	60-Nd-145	Ignatjuk et al., 1985 Replaces MAT nr. 6051 in BROND-NDS1	869
6147	61-Pm-147	Ignatjuk et al., 1985 Replaces MAT nr. 6171 in BROND-NDS1	955
6200	62-Sm-nat	Ignatjuk et al, 1989 New in BROND-2.	3095
6244	62-Sm-144	Ignatjuk et al, 1989 New in BROND-2.	444
6247	62-Sm-147	Ignatjuk et al., 1985 Replaces MAT nr. 6211 in BROND-NDS1	1260
6248	62-Sm-148	Zakharova et al., 1987 New in BROND-2.	934
6249	62-Sm-149	Ignatjuk et al., 1985 Replaces MAT nr. 6221 in BROND-NDS1	1209
6250	62-Sm-150	Zakharova et al., 1987 New in BROND-2.	904
6251	62-Sm-151	Ignatjuk et al., 1985 Replaces MAT nr. 6231 in BROND-NDS1	1150
6252	62-Sm-152	Belanova et al., 1987 New in BROND-2.	939
6254	62-Sm-154	Belanova et al., 1989 New in BROND-2.	904
6353	63-Eu-153	Ignatjuk et al., 1985/1989 New in BROND-2. BROND-1 had included data for Eu-151 and Eu-153 taken over from ENDF/B-5.	2524

6400	64-Gd-nat	Blokhin 1989 New in BROND-2	3305
6452	64-Gd-152	"	1609
6454	64-Gd-154	"	1607
6455	64-Gd-155	"	1738
6456	64-Gd-156	"	1551
6457	64-Gd-157	"	1611
6458	64-Gd-158	"	1522
6460	64-Gd-160	"	1304

BROND MAT Nr.	**nuclide**	**origin**	**# of records**
6862	68-Er-162	Zacharova et al., 1976/1992 New in BROND-2.	1139
6864	68-Er-164	"	1163
6866	68-Er-166	"	1267
6867	68-Er-167	"	1502
6868	68-Er-168	"	1400
6870	68-Er-170	"	1357
7381	73-Ta-181	G.N. Manturov, J.A. Korchagina, 1988/1991. New in BROND-2.	2878

BROND MAT Nr.	nuclide	origin	# of records
7482	74-W-182	Abagjan et al., 1983, revised 1990. Based on the ENDF/B-4 evaluation by Ottewite et al., but new evaluation in the resolved and unresolved region. Includes γ-production data. New in BROND-2	3110
7483	74-W-183	"	3560
7484	74-W-184	"	3020
7486	74-W-186	"	2945
7500	75-Re-nat	Nikolaev et al., 1988/1991 New in BROND-2.	1338
7600	76-Os-nat	M.N. Nikolaev 1990 New in BROND-2.	2295
7700	77-Ir-nat	Nikolaev et al., 1990 New in BROND-2	2574
7925	79-Au-197	Young 1984/1991 ENDF/B-6 taken over as an international standard. Identical with ENDF/B-6 Rev.1	6427
8202	82-Pb-nat	Blokhin, Ignatjuk et al., 1990, based on: Hermsdorf, Kalka, Dresden 1984, INDC(GDR)-39(1986). Includes γ-production data.	4704
8211	82-Pb-204	Blokhin et al., 1990	2655
8212	82-Pb-206	"	3189
8213	82-Pb-207	"	2416
8214	82-Pb-208	"	1956
8301	83-Bi-209	Blokhin et al., 1990 New in BROND-2. Includes γ-production data.	3568

BROND MAT Nr.	nuclide	origin	# of records
		Actinides	
9032	90-Th-232	Nikolaev et al., 1983 New in BROND-2.	1526
9211	92-U-233	Sukhovitskij et al., Minsk, 1990 Report IJE-2-25 (1991) New in BROND-2.	3014
9241	92-U-235	Konshin et al., Minsk, 1985 Reports INDC(CCP)-257 (1985) in Russian, INDC(CCP)-320 (1987, transl. 1990). **Note**: The documentation text in MF/MT 1451 is still missing. See Yad. Konst. 1991/3 p. 208.	2490
9251	92-U-236	Konshin et al., Minsk, 1986 Reference: A.B. Klepatskij, V.A.Konshin, V.M. Maslov, E.Sh. Sukhovitiskij. Evaluation of U-236 neutron data in "Jadernye Konstanty" issue 2/1987, two papers on pages 3-21. English translation INDC(CCP)-280 and INDC(CCP)-295.	1719
9261	92-U-238	Nikolaev et al., Obninsk, 1980/1990 Revisions of MAT nr. 9271 in BROND-NDS1.	2020

BROND MAT Nr.	**nuclide**	**origin**	**# of records**
9411	94-Pu-238	Sukhovitzkij et al., Minsk, 1987 New in BROND-2.	1468
9421	94-Pu-239	Konshin et al., Minsk, 1980/1990 Includes γ-production data. Report INDC(CCP)-256 (1984) in Russian.	2258
9431	94-Pu-240	Sukhovitzkij et al., Minsk, 1980/1985 Includes γ-production data. Report INDC(CCP)-256 (1984) in Russian.	1778
9441	94-Pu-241	Konshin et al., Minsk, 1979/1985 Includes γ-production data. Report INDC(CCP)-256 (1984) in Russian. **Note**: The documentation text in MF/MT 1451 is still missing. See Yad. Konst. 1991/3 p. 227.	2142
9451	94-Pu-242	Konshin et al., Minsk, 1980/1982 Report INDC(CCP)-256 (1984) in Russian.	1565

BROND MAT Nr.	nuclide	origin	# of records
9541	95-Am-241	Blokhin et al., 1990 New in BROND-2. (In BROND-1 the evaluation for Am-241 in MAT 9511 had been taken over from UKNDL-1009B.)	3283
9542	95-Am-242	Blokhin et al., 1990 New in BROND-2.	1476
9543	95-Am-242m	Blokhin et al., 1990 New in BROND-2.	2849
9544	95-Am-243	Blokhin et al., 1990 New in BROND-2. (In BROND-1 the evaluation for Am-243 in MAT 9541 had been based on UKNDL-1010.)	3280
9611	96-Cm-242	Sukhovitskij et al., 1987 New in BROND-2.	1108
9631	96-Cm-244	Sukhovitskij et al., 1987 New in BROND-2.	1315