**Nuclear Data Section**

**International Atomic Energy Agency**

**P.O.Box 100, A-1400 Vienna, Austria**

**Memo CP-D/994**

**Date:** 16 April 2020

**To:** Distribution

**From:** T. Zholdybyev, N. Otsuka

**Subject: Differential cross sections in preprints from Almaty (NRDC2019 A35)**

The Institute of Nuclear Physics of Academy of Science Kaz. SSR (Almaty) published in 1970, 1990 and 1991 three preprints for data measured with light charged particles accelerated by the cyclotron of the institute. In these preprints, angular differential cross sections of α and 3He elastic and inelastic scattering as well as a few (d,p) reactions are summarized in 75 tables in total (See Appendix for the details of these tables).

We made all numbers computer readable and compiled in EXFOR entries. When there is an EXFOR entry compiling the same data set (typically by digitization) with an appropriate citation, we revised the EXFOR entry. Otherwise the data set was compiled in a new EXFOR entry. When we could not find any publication suitable for citation, the data set was compiled in D8016, D8017 or D8013 for the preprints published in 1970, 1990 and 1991, respectively with the preprint as the primary reference.

Newly created entries were partially finalized in TRANS.D119, D120 and D122, and the pending entries were transmitted by PRELIM.D126. Revised area F entries were sent to CNPD and a part of them will be transmitted in PRELIM.F075.

Creation of two entries with Voprosy Atomn. Nauki i Tekhniki, Ser.Fiz.Yad.Reak. (D0942 and D0947) was done with Olena Gritzay.

**Distribution:**

[a.koning@iaea.org](mailto:a.koning@iaea.org)

[abhihere@gmail.com](mailto:abhihere@gmail.com)

[aloks279@gmail.com](mailto:aloks279@gmail.com)

daniela.foligno@oecd-nea.org

[dbrown@bnl.gov](mailto:dbrown@bnl.gov)

[draj@barc.gov.in](mailto:draj@barc.gov.in)

[fukahori.tokio@jaea.go.jp](mailto:fukahori.tokio@jaea.go.jp)

[ganesan555@gmail.com](mailto:ganesan555@gmail.com)

[gezg@ciae.ac.cn](mailto:gezg@ciae.ac.cn)

[iwamoto.osamu@jaea.go.jp](mailto:iwamoto.osamu@jaea.go.jp)

[j.c.sublet@iaea.org](mailto:j.c.sublet@iaea.org)

[jmwang@ciae.ac.cn](mailto:jmwang@ciae.ac.cn)

[kaltchenko@kinr.kiev.ua](mailto:kaltchenko@kinr.kiev.ua)

[kenya.suyama@oecd-nea.org](mailto:kenya.suyama@oecd-nea.org)

[kimura.atsushi04@jaea.go.jp](mailto:kimura.atsushi04@jaea.go.jp)

[l.vrapcenjak@iaea.org](mailto:l.vrapcenjak@iaea.org)

[manuel.bossant@oecd-nea.org](mailto:manuel.bossant@oecd-nea.org)

[masaaki@nucl.sci.hokudai.ac.jp](mailto:masaaki@nucl.sci.hokudai.ac.jp)

[michael.fleming@oecd-nea.org](mailto:michael.fleming@oecd-nea.org)

[mmarina@ippe.ru](mailto:mmarina@ippe.ru)

[nicolas.soppera@oecd-nea.org](mailto:nicolas.soppera@oecd-nea.org)

[n.otsuka@iaea.org](mailto:n.otsuka@iaea.org)

[nrdc@jcprg.org](mailto:nrdc@jcprg.org)

[odsurenn@gmail.com](mailto:odsurenn@gmail.com)

[ogritzay@kinr.kiev.ua](mailto:ogritzay@kinr.kiev.ua)

[ogrudzevich@ippe.ru](mailto:ogrudzevich@ippe.ru)

[otto.schwerer@aon.at](mailto:otto.schwerer@aon.at)

[pikulina@expd.vniief.ru](mailto:pikulina@expd.vniief.ru)

[pritychenko@bnl.gov](mailto:pritychenko@bnl.gov)

[s.okumura@iaea.org](mailto:s.okumura@iaea.org)

[samaev@obninsk.ru](mailto:samaev@obninsk.ru)

[sbabykina@yandex.ru](mailto:sbabykina@yandex.ru)

[scyang@kaeri.re.kr](mailto:scyang@kaeri.re.kr)

[selyankina@expd.vniief.ru](mailto:selyankina@expd.vniief.ru)

[sonzogni@bnl.gov](mailto:sonzogni@bnl.gov)

[stakacs@atomki.mta.hu](mailto:stakacs@atomki.mta.hu)

[stanislav.hlavac@savba.sk](mailto:stanislav.hlavac@savba.sk)

[sv.dunaeva@gmail.com](mailto:sv.dunaeva@gmail.com)

[tada@nucl.sci.hokudai.ac.jp](mailto:tada@nucl.sci.hokudai.ac.jp)

[taova@expd.vniief.ru](mailto:taova@expd.vniief.ru)

[tarkanyi@atomki.hu](mailto:tarkanyi@atomki.hu)

[vvvarlamov@gmail.com](mailto:vvvarlamov@gmail.com)

[v.zerkin@iaea.org](mailto:v.zerkin@iaea.org)

[vidyathakur@yahoo.co.in](mailto:vidyathakur@yahoo.co.in)

[vsemkova@inrne.bas.bg](mailto:vsemkova@inrne.bas.bg)

[yolee@kaeri.re.kr](mailto:yolee@kaeri.re.kr)

[zholdybayev@inp.kz](mailto:zholdybayev@inp.kz)

**Appendix: Angular differential cross sections compiled from three preprints published by Institute of Nuclear Physics (Almaty)**

* **Tables 1 to 15**

V.Yu. Gonchar, K.S. Zheltonog, G.N. Ivanov, A.V. Yushkov “Elastic and inelastic scattering of alpha particles and the stripping reaction on the light and medium nuclei”, Academy of Sciences of the Kazakh SSR Institute of Nuclear Physics, Alma-Ata 1970 (В.Ю. Гончар, К.С. Желтоног, Г.Н. Иванов, А.В. Юшков, “Упругое и неупругое рассеяние альфа-частиц и реакция срыва на легких и средних ядрах”, Академия Наук Казахской ССР Институт Ядерной Физики, Алма-Ата 1970 г.). The preprint number on the cover page is Π-104, and **R,IYFK-P-104,1970** in EXFOR.

* **Tables 16 to 59**

N.N. Pavlova, S.Ya. Aisina, K.A. Kuterbekov, I.N. Kuhtina, A.V. Yushkov “Tables of differential cross sections for the elastic and inelastic scattering of α particles with energies from 30 to 50 MeV on Z=6-30 nuclei. II.”, Academy of Sciences of the Kazakh SSR Institute of Nuclear Physics, Alma-Ata 1990 (Н.Н. Павлова, С.Я. Айсина, К.А. Кутербеков, И.Н. Кухтина, А.В. Юшков “Таблицы дифференциальных сечений упругого и неупругого рассеяния α-частиц с энергиями от 30 до 50 МэВ на ядрах с z-6-30.II.”, Академия Наук Казахской ССР Институт Ядерной Физики, Алма-Ата 1990). There is no preprint number on the cover page, and **W,PAVLOVA,1970** in EXFOR.

* **Tables 60 to 75**

K.A. Kuterbekov, S.Ya. Aisina, N.N. Pavlova, A.V. Yushkov “Tables of differential cross sections for the elastic and inelastic scattering of α particles and 3He with energies from 30 to 60 MeV on nuclei with Z= 29-50. III.”, Academy of Sciences of the Kazakh SSR Institute of Nuclear Physics, Alma-Ata 1991 (К.А. Кутербеков, С.Я. Айсина, Н.Н. Павлова, А.В. Юшков, “Таблицы дифференциальных сечений упругого и неупругого рассеяния α-частиц и 3Не с энергиями от 30 до 60 МэВ на ядрах с Z=28-50.III.”, Академия Наук Казахской ССР Институт Ядерной Физики, АлмаАта 1991). There is no preprint number on the cover page, and W,KUTERBEKOV,1971 in EXFOR.

The references in **bold** font are those indicated in the footnotes of the 1990 preprint. Other references were identified by us.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Table** | **Reference** | **Targ.** | **Proj.** | **Reaction** | **Elab (MeV)** | **EXFOR** | **Remarks** |
| 1 | R,IYFK-P-104,1970 | 1H | a | EL | 39 | D8016.002 |  |
| 2 | R,IYFK-P-104,1970 | 12C | a | EL | 39 | D8016.003 | Superseded by D8017.002 (Table 17) |
| 3 | J,IZV,32,604,1968 | 24Mg | a | EL | 39 | D8016.004 | Superseded by F0668.002 (Table 18) |
| 4 | J,IZV,32,604,1968 | 28Si | a | EL | 39 | D8016.005 | Superseded by F0668.003 (Table 19) |
| 5 | J,IZK,,(6),16,1968; J,YF,8,678,1968 | 58Ni | a | EL, INL | 39 | D8015.002+003 | Delete F1168.002 and F1184.003+004. |
| 6 | J,IZK,,(6),16,1968; J,YF,8,678,1968 | 64Ni | a | EL, INL | 39 | D8015.004+005 |  |
| 7 | J,IZK,,(6),16,1968; J,YF,8,678,1968 | 64Zn | a | EL, INL | 39 | D8015.006+007 |  |
| 8 | J,IZK,,(6),16,1968; J,YF,8,678,1968 | 68Zn | a | EL, INL | 39 | D8015.008+009 |  |
| 9 | J,YF,5,1179,1967 | 74Ge | a | EL | 39 | D8016.006 | Superseded by D8017.004 (Table 24) |
| 10 | J,YF,5,1179,1967 | natPb | a | EL | 39 | F1168.003 |  |
| 11 | J,IZK,,(4),34,1969 | 1H | d | EL | 19 | D8014.002 |  |
| 12 | J,IZK,,(4),34,1970 | 1H | d | D,P | 19 | D8014.003 |  |
| 13 | J,IZK,,(4),34,1969 | 12C | d | D,P | 19 | D8014.004 |  |
| 14 | J,IZK,,(4),34,1969 | 28Si | d | D,P | 19 | D8014.005 |  |
| 15 | J,IZK,,(4),34,1969 | 52Cr | d | D,P | 19 | D8014.006 |  |
| 16 | **J,YF,9,702,1969** | 206Pb 207Pb 208Pb | a | EL | 39 | D0940.002+003+004 (in EXFOR) |  |
| 17 | W,PAVLOVA,1990 | 12C | a | EL, INL | 39 | D8017.002+003 | Current F0672.004 data look strange. The preprint footnote gives **J,IZK,,(6),3,1969**, but it is an article for theoretical analysis without a plot of the Table 17 data. Hence we added this IZK article as a related reference (REL-REF). |
| 18 | **J,IZV,32,604,1968** | 24Mg | a | EL, INL | 39 | F0668.002+004 | Originally data from authors were in F0497.005+006+007 but with some mistakes. (Dupl. of F0668.002+004) |
| 19 | **J,IZV,32,604,1968** | 28Si | a | EL, INL | 39 | F0668.003+005 | Delete F0497.013 (Dupl. of F0668.003) |
| 20 | **J,VAT/V,,(7/9),62,1973** | 54Cr | a | EL, INL | 38 | D0942.002+003 (in EXFOR) |  |
| 21 | **J,VAT/V,,(7/9),62,1973** | 54Fe | a | EL, INL | 38 | D0942.004+005 (in EXFOR) | Delete F1160.002 (Dupl. of D0942.004) |
| 22 | **J,VAT/V,,(7/9),62,1973** | 60Ni | a | EL, INL | 38 | D0942.006+007 (in EXFOR) |  |
| 23 | **J,VAT/V,,(7/9),62,1973** | 62Ni | a | EL, INL | 38 | D0942.008+009 (in EXFOR) |  |
| 24 | W,PAVLOVA,1990 | 74Ge | a | EL, INL | 39 | D8017.004+005 | The preprint footnote gives **J,YF,5,1179,1967**.However the elastic scattering data set of natural Ge plotted on this article (F1184.002) looks different from the Table 24 data set. Hence we added this YF article as a related reference (REL-REF). |
| 25 | J,VAT/V,,(1/18),7,1973 | 92Mo | a | EL, INL | 38 | D0947.002+003 (in EXFOR) | The preprint footnote gives **J,VAT/V,,(7/9),62,1973**. But it seems J,VAT/V,,(1/18),7,1973 is more appropriate for citation. |
| 26 | **J,VAT/V,,(1/18),7,1977** | 100Mo | a | EL, INL | 38 | D0947.004+005 (in EXFOR) |  |
| 27 | **J,IZV,35,836,1971** | 106Pd | a | EL, INL | 38 | D0948.002+003 (in EXFOR) |  |
| 28 | **C,73TBILISI,,300,1973** | 64Zn | a | EL, INL | 29 | F0865.002+006 (PRELIM.F075) |  |
| 29 | **C,73TBILISI,,300,1973** | 66Zn | a | EL, INL | 29 | F0865.003+007 (PRELIM.F075) |  |
| 30 | **C,73TBILISI,,300,1973** | 68Zn | a | EL, INL | 29 | F0865.004+008 (PRELIM.F075) |  |
| 31 | **C,73TBILISI,,300,1973** | 70Zn | a | EL, INL | 29 | F0865.005+009 (PRELIM.F075) | Delete F0497.017 (Dupl. of F0865.005) |
| 32 | **J,IZK,,(2),82,1974** | 64Zn | a | EL, INL | 38 | F0865.002+006 (PRELIM.F075) |  |
| 33 | **J,IZK,,(2),82,1974** | 66Zn | a | EL, INL | 38 | F0865.003+007 (PRELIM.F075) |  |
| 34 | **J,IZK,,(2),82,1974** | 68Zn | a | EL, INL | 38 | F0865.004+008 (PRELIM.F075) |  |
| 35 | **J,IZK,,(2),82,1974** | 70Zn | a | EL, INL | 38 | F0865.005+009 (PRELIM.F075) | Delete F0497.017 (Dupl. of F0865.005) |
| 36 | **J,IZK,,(4),35,1975** | 64Zn | a | EL, INL | 50.5 | F0865.002+006 (PRELIM.F075) |  |
| 37 | **J,IZK,,(4),35,1975** | 66Zn | a | EL, INL | 50.5 | F0865.003+007 (PRELIM.F075) |  |
| 38 | **J,IZK,,(4),35,1975** | 68Zn | a | EL, INL | 50.5 | F0865.004+008 (PRELIM.F075) |  |
| 39 | **J,IZK,,(4),35,1975** | 70Zn | a | EL, INL | 50.5 | F0865.005+009 (PRELIM.F075) | Delete F0497.017 (Dupl. of F0865.005) |
| 40 | **J,YF,19,(4),729,1974** | 68Zn | a | EL, INL | 40.7 | D0939.002+003 (in EXFOR) |  |
| 41 | **J,YF,19,(4),729,1974** | 68Zn | a | EL, INL | 29 | D0939.002+003 (in EXFOR) |  |
| 42 | **J,YF,19,(4),729,1974** | 68Zn | a | EL, INL | 50.5 | D0939.002+003 (in EXFOR) |  |
| 43 | **J,IZV,41,176,1977** | 56Fe | a | EL, INL | 29.3 | F1160.003+005 (PREIM.F075) |  |
| 44 | J,IZV,53,37,1989 | 12C | a | EL, INL | 29.3 | F0497.002+018 |  |
| 45 | J,IZV,53,37,1989 | 12C | a | EL, INL | 50.5 | F0497.002+019 |  |
| 46 | J,IZV,53,37,1989 | 12C | a | EL, INL | 40.4 | F0497.002+019 |  |
| 47 | J,IZV,53,37,1989 | 12C | a | EL, INL | 45.4 | F0497.002+019 |  |
| 48 | W,PAVLOVA,1990 | 28Si | a | EL, INL | 50.5 | D8017.006+007 | Independent from D0925.020+021? |
| 49 | W,PAVLOVA,1990 | 16O | a | EL, INL | 40.1 | D8017.008+009 |  |
| 50 | W,PAVLOVA,1990 | 24Mg | a | EL, INL | 50.5 | F0497.003+004 | Originally data from authors were in 003+004 but with some mistakes. |
| 51 | J,IZK,,(6),50,2002 | 48Ti | a | EL, INL | 50.5 | D0926.002+003 (in EXFOR) |  |
| 52 | W,PAVLOVA,1990 | 52Cr | a | EL, INL | 29.3 | D8017.010+011 | Elastic data unreadable |
| 53 | W,PAVLOVA,1990 | 52Cr | a | EL, INL | 40 | D8017.010+011 |  |
| 54 | W,PAVLOVA,1990 | 52Cr | a | EL, INL | 50 | D8017.010+011 | Elastic data unreadable |
| 55 | W,PAVLOVA,1990 | 54Fe | a | EL, INL | 29.3 | D8017.012+013 |  |
| 56 | W,PAVLOVA,1990 | 58Fe | a | EL, INL | 45.4 | D8017.014+015 | Elastic data unreadable |
| 57 | W,PAVLOVA,1990 | 58Fe | a | EL, INL | 50 | D8017.014+015 |  |
| 58 | J,IZV,53,37,1989 | 58Ni | a | EL, INL | 50.5 | F0497.009+020 | Inelastic data unreadable |
| 59 | W,PAVLOVA,1990 | 62Ni | a | EL, INL | 50 | D8017.016+017 | Inelastic data unreadable |
| 60 | J,YF,66,627,2003 | 90Zr | a | EL, INL | 50.1 | F0561.008+009 (PRELIM.F075) |  |
| 61 | J,YF,66,627,2003 | 94Zr | a | EL, INL | 50.1 | F0561.010+011 (PRELIM.F075) |  |
| 62 | W,KUTERBEKOV,1991 | 92Mo | a | EL, INL | 49.2 | D8013.002+003 |  |
| 63 | W,KUTERBEKOV,1991 | 94Mo | a | EL, INL | 50.5 | D8013.004+005 |  |
| 64 | W,KUTERBEKOV,1991 | 96Mo | a | EL | 45 | D8013.006 |  |
| 65 | W,KUTERBEKOV,1991 | 98Mo | a | EL, INL | 45 | D8013.007+008 |  |
| 66 | W,KUTERBEKOV,1991 | 112Sn | a | EL, INL | 50.1 | D8013.009+010 |  |
| 67 | W,KUTERBEKOV,1991 | 114Sn | a | EL, INL | 50.1 | D8013.011+012 |  |
| 68 | W,KUTERBEKOV,1991 | 116Sn | a | EL, INL | 40.4 | D8013.013+014 |  |
| 69 | W,KUTERBEKOV,1991 | 118Sn | a | EL, INL | 50.5 | D8013.015+016 |  |
| 70 | C,2001SAROV ,,194,2001 | 120Sn | a | EL, INL | 50.5 | F0560.002+003 (PRELIM.F075) |  |
| 71 | W,KUTERBEKOV,1991 | 122Sn | a | EL, INL | 40.1 | D8013.017+018 |  |
| 72 | W,KUTERBEKOV,1991 | 124Sn | a | EL, INL | 40.4 | D8013.019+020 |  |
| 73 | C,2001SAROV ,,194,2001 | 124Sn | a | EL, INL | 50.5 | F0560.004+005 (PRELIM.F075) |  |
| 74 | W,KUTERBEKOV,1991 | 64Ni | 3He | EL, INL | 50 | D8013.021+022 |  |
| 75 | W,KUTERBEKOV,1991 | 64Zn | 3He | EL, INL | 50 | D8013.023+024 |  |