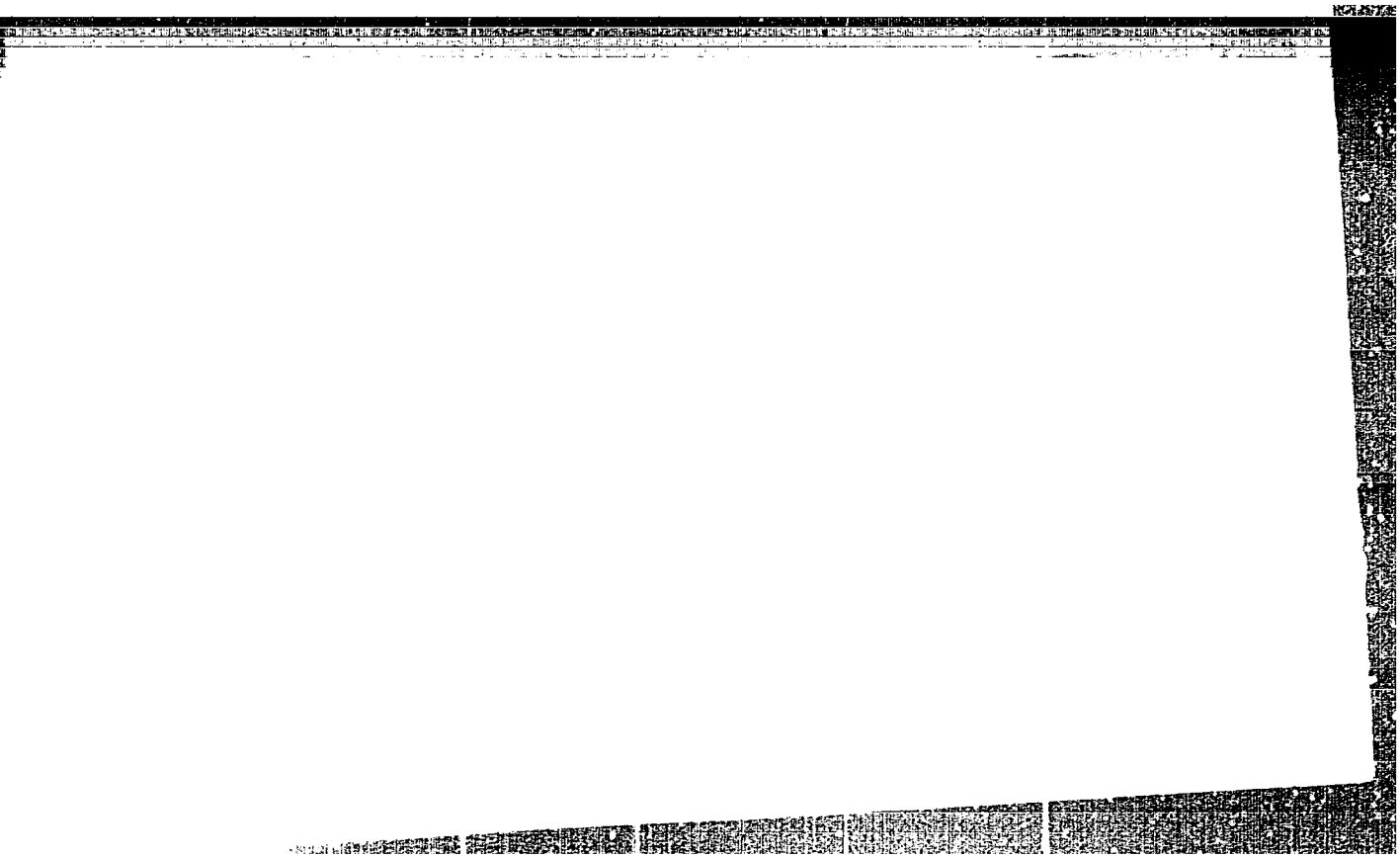
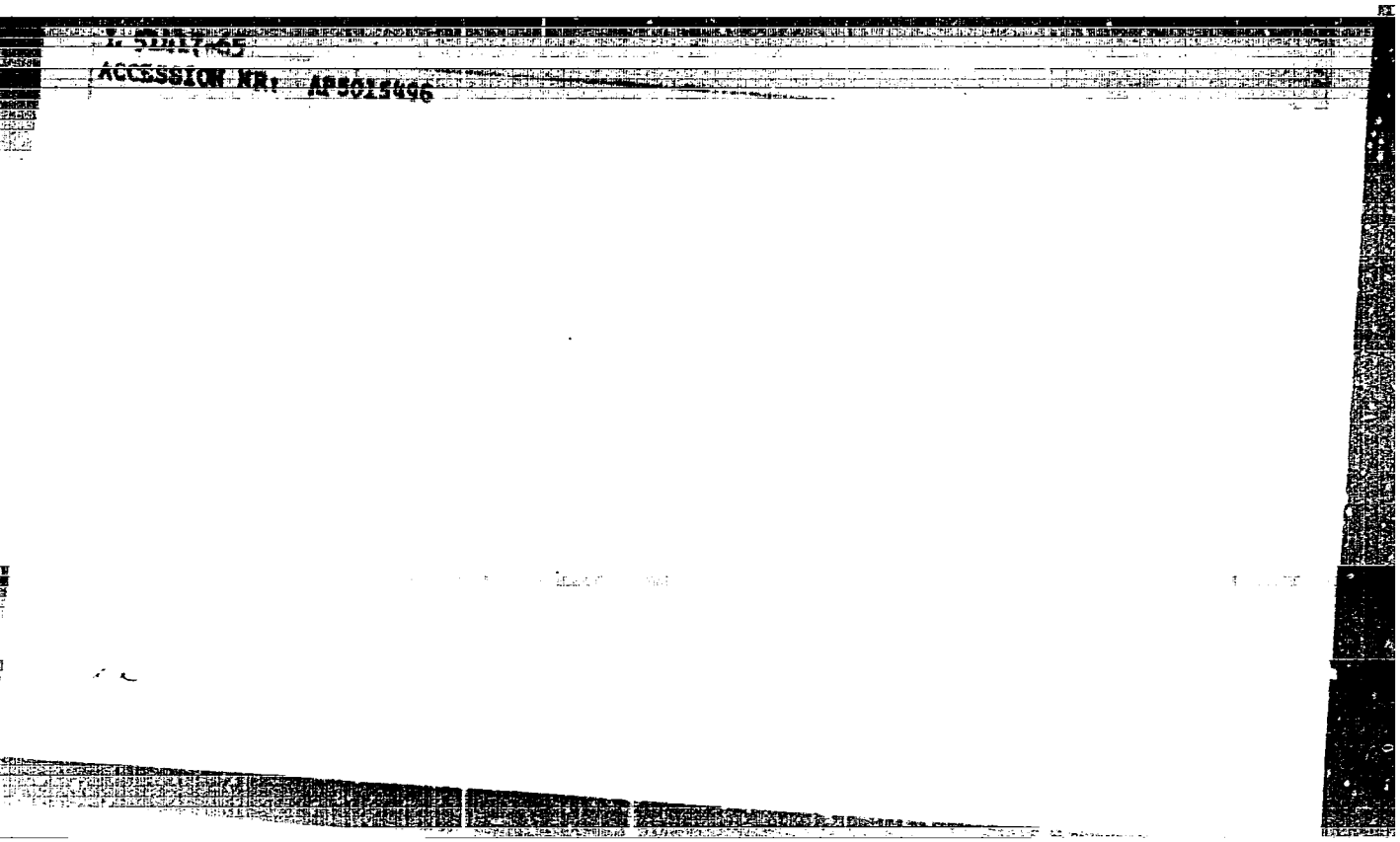


APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000723310005-0"



Klyucharev

USSR / Microbiology - Microbes Pathogenic to Humans and Animals F-4

Abs Jour: Referat. Zh. Biol., No. 1, 1958, 740

Author : Klyucharev

Title : Carrying of Dysentery Bacilli

Orig Pub: Zdravookhr. Belorussii, 1955, No. 1, 28-30

Abstract: No abstract.

Card 1/1

KLYUCHAREV, A.A.

Clinical characteristics of an outbreak of Flexner's dysentery. Zhur.mikrobiol.epid.i immun. no.3:63-64 Mr '55. (MLRA 8:7)

1. Iz kafedry infektsionnykh bolezney (zav. prof. A.N.Filippovich) Minskogo meditsinskogo instituta.
(DYSENTERY, BACILLARY, epidemiology, in Russia)

KLYUCHAREV, A. A.

KLYUCHAREV, A. A. --"Clinical Aspects of the Course of Dysentery Caused by Various Types of Agents." Minsk, 1956. (Dissertation for the Degree of Candidate in Medical Sciences).

So.: Knizhnaya Letopis', No. 7, 1956.

KLYUCHAREV, A.A.

Clinical aspects of dysentery brought about by different causative organisms. Sov.med. 20 no.7:62-64 Jl '56. (MLRA 9:10)

1. Is kliniki infektsionnykh bolezney (zav. kafedroy infektsionnykh bolezney - prof. A.N.Filippovich) Minskogo meditsinskogo instituta.
(DYSENTERY, BACILLARY, statist.
clin. manifest. comparison in Sonnei & Flexner's dysentery)

FILIPPOVICH, A.N.; KLYUCHAREV, A.A.; TSVIRKO, M.M.; MEYTES, L.O.

Clinical toxicoinfection of Salmonella etiology. Zdrav.Belor. 5 no.8:42-44 Ag '59. (MIRA 12:10)

1. Iz kliniki infektsionnykh bolezney (zaveduyushchiy - prof. A.N.Filippovich) Minskogo meditsinskogo instituta.
(SALMONELLA TYPHIMURIUM) (FOOD POISONING)

KLYUCHAREV, A.A., dotsent; FILIPPOVICH, F.K., vrach; KUL'SHINSKAYA, Ye.P., vrach; STAROVOYTOVA, T.D., vrach

Characteristic clinical features of dysentery in adults. Zdrav. Belor. 6 no.3:51-53 Mr '60. (MIRA 13:5)

1. Iz kafedry infektsionnykh bolezney Minskogo meditsinskogo instituta (zaveduyushchiy - professor A.N. Filippovich) i Minskoy infektsionnoy klinicheskoy bol'nitsy (glavnyy vrach Z.O. Alikina).
(DYSENTERY)

KLYUCHAREV, A.A., dotsent

Differential diagnosis of chronic dysentery. Zdrav. Belor. 6 no. 5:16-19 My '60. (MIRA 13:10)

1. Iz kafedry infektsionnykh bolezney (zaveduyushchiy - prof. A.N. Filippovich) Minskogo meditsinskogo instituta.
(DYSENTERY)

KLYUCHAREV, A.A., dotsent; SHISHKO, Ye.I., assistent

Methodological work at the Minsk Medical Institute. Zdrav. Bel. 7 no.6:14-16 Je '61. (MIRA 15:2)

(MINSK--MEDICAL COLLEGES)

KLYUCHAREV, A.A., dotsent; SHISHKO, Ye.I., assistent

Forty years of the Minsk Medical Institute. Zdrav. Bel. 7 no.10: 70-73 O '61. (MIRA 14:11)
(MINSK--MEDICAL COLLEGES)

KLYUCHAREV, A.A.; SOKOLENZON, Ye.Ye.; LEBEDEV, N.I.; PASHKOVSKAYA, B.S.

Bacterial vaccion in dysentery. Zdrav. Bel. 9 no.8:6-9 Ag '63.
(MIRA 17:3)

1. Iz kafedry infektsionnykh bolezney s epidemiologiyey (zav. - doktor med. nauk D.V. Poleshko) Minskogo meditsinskogo instituta.

ACCESSION NR: AP4040909 S/0057/64/034/006/1050/1056

AUTHOR: Kaganskiy, M.G.; Kaminskiy, D.L.; Klyucharev, A.N.

TITLE: Coherent oscillations in a high voltage Penning discharge

SOURCE: Zhurnal tekhnicheskoy fiziki, v.34, no.6, 1964, 1050-1056

TOPIC TAGS: plasma, discharge oscillations, plasma oscillations, argon plasma, Penning discharge, external magnetic field

ABSTRACT: Large amplitude coherent oscillations of frequency from 1 to 100 kilocycles/sec were observed in a high voltage Penning discharge in argon in a longitudinal magnetic field. The discharge took place between cold cathodes separated by 5 cm and a cylindrical anode of diameter 0.6, 1 or 2 cm. The pressure was varied from 0.0005 to 0.004 mm Hg, the anode potential from 1 to 5 kV, and the magnetic field from 0 to 3500 Oe. The ions passing through a small opening in one cathode were analyzed electrostatically. Nearly sinusoidal coherent oscillations were observed in both the cathode current and the anode potential, but only under such conditions that the discharge current increased with increasing anode potential. Grounding the anode through a 150 microfarad capacitor did not influence the cathode current os-

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ACCESSION NR: AP4040309

served by other authors in Penning discharges are mentioned, and it is shown that these differ in nature from those discussed above. A partly successful attempt is made to interpret the results in terms of the convective instability in a longitudinal electric field discussed by B.B.Kadomtsev (Nucl.Fus.1,286,1961), but a number of features remain unexplained and it is concluded that further investigation is required. Orig.art.has: 4 formulas and 5 figures.

ASSOCIATION: Fiziko-tekhnicheskiy institut im.A.F.Ioffe AN SSSR Leningrad (Physico-technical Institute, AN SSSR)

SUBMITTED: 15Jul63 DATE ACQ: 19Jun64 ENCL: 00

SUB CODE: ME, NM NR REF SOV: 003 OTHER: 007

Card 3/3

M

2

Structure and Magnetic Properties of Alloys of the Heusler Type. A. P. [illegible] (Zhur. Eksper. i Teoret. Fiziki (J. Exper. Theoret. Physics), [illegible], [illegible] 1505–1511; Cf. Abs., 1941, [illegible], 1763).—[In Russian.] From experimental X-ray and magnetic data on various Cu_2SnX and Cu_2AlX alloys (X = chromium, iron, cobalt, or nickel), shown in 11 figures and 5 tables, K. finds that the Cu_2SnX alloys obey the Hume-Rothery law and form stable β phases, the stability of which increases the more the 3d shell of the metal X is filled. Magnetic measurements show that the 4s level becomes energetically less satisfactory than the 3d level. The chromium, manganese, and iron alloys possess a hexagonal lattice at room temperature; the cobalt and nickel alloys form a stable β phase. For X = chromium + nickel or nickel, the alloys are paramagnetic; for nickel alone only slightly so, indicating a compensation of the spin by a transition from the nickel 4s to the 3d shell. For X = manganese, iron, or cobalt the alloys are ferromagnetic, in the β phase the 4s levels are not filled. The Cu_2AlX alloys do not obey the Hume-Rothery law. With the exception of Cu_2AlMn they do not show a body-centred cubic lattice structure. Ferromagnetism is due not to the lattice type or to superstructure but only to obedience to Slater's law. Thus the alloy copper-aluminium-manganese, containing 11% aluminium, is ferromagnetic in the face-centred rather than the body-centred form. The parameters measured were found to be: Cu_2AlMn, 5·91 A.; Cu_2SnX, X = Mn, 6·07; (Cr : Ni = 63 : 37), 5·97; a = 2·1 × 10^{-6}; Fe, 5·98; Co, 5·97; Ni, 5·91; a = 0·31 × 10^{-6}. Cu_2SnFe also formed a hexagonal phase, a = 2·73 A., c/a = 1·60; similarly for X = Mn, Cr + Ni, and Ni, a = 2·73–2·74, c/a = 1·60. Cu_2AlCr formed two phases: face-centred, a = 3·61; and body-centred, a = 2·93. Cu_2AlNi gave only one hexagonal form, a = 4·16, c/a = 1·66, a = 8·6 × 10^{-6}. The Cu_2Mn – 11% Al alloy is face-centred, a = 3·68; H = 1000 oersted, I = 90 gauss; quenched from 700° C. or above it gives a body-centred cubic phase, a = 2·94.

No 12

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ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

KLYUCHAREV, A.P.

USSR/Nuclear Physics - Nuclear Reactions. C-5

Abs Jour : Referat Zhur - Fizika, No 4, 1957, 8811

Author : Klyucharev, A.P., Bolotin, L.I., Luteik, V.A.
Inst : Physico-Technical Institute, Academy of Sciences, Ukrainian SSR.
Title : Elastic Scattering of 5.4 Mev Protons by Various Nuclei.

Orig Pub : Zh. eksperim. i teor. fiziki, 1956, 30, No 3, 573-574

Abstract : A study was made of the angular distribution of protons with innitial energy 5.4 Mev, elastecally scattered by nuclei of beryllium, carbon, fluorine, magnesium, aluminum, calcium, manganese, nickel, copper, and zinc. The protons scattered by angles from 20 to 160° were simultaneously recorded by photographic plates. The angular resolution was ± 2.5°. The targets employed were thin (several microns) films or foils. The angular distribution obtained for the acattered protons differs sharply from the Coulomb distribution, and is not

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Abs Jour : Ref Zhur - Fizika, No 4, 1957, 8811

the same for the various nuclei. For beryllium and carbon a large maximum of scattering was observed near 150 -- 160°, but the ratio of the cross section of the nuclear scattering to the Coulomb scattering in carbon is four times greater than in beryllium. The authors attribute this to the formation of a intermediate N^{13} nucleus, which has an excitation level, in this region of energies and consequently resonant scattering takes place. The scattering of manganese and aluminum is similar. The distributions for nickel, copper, and zinc are identical. For manganese the qualitative course of the distribution is analogous to that of the proceding elements, but the minimum and the second maximum are shifted towards the larger angles. An unexpectedly large value was obtained for the ratio for calcium, particularly at large angles. For heavier nuclei there was a pronounced manifestation of the interference nature of

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Abs Jour : Ref Zhur - Fizika, No 4, 1957, 8811

elastic scattering. Attempts to treat the results in accordance with an optical model were not successful.

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KLYUCHAREV, A.P.

SUBJECT USSR / PHYSICS CARD 1 / 2 PA - 1435
AUTHOR KLJUCAREV,A.P., ESEL'SON,B.N., BAL'TER,A.K.
TITLE The Study of the Reaction of He^3 with Deuterons.
PERIODICAL Dokl.Akad.Nauk, 109, fasc.4, 737-739 (1956)
Issued: 10 / 1956 reviewed: 10 / 1956

Here the excitation function of the reaction $He^3(dp)He^4$ is studied and the absolute value of its cross section is measured. The deuterons for the bombardment of the target were accelerated in the high-tension discharge tube of an electrostatic generator. A gas target covered with an Al foil of 5 μ thickness was used, and therefore the energy losses of the deuterons when passing through the covering foil must be taken into account. The arrangement of the target and of the counter for the registration of the α-particles produced is described on the basis of a drawing. The ion bundle of the accelerated deuterons passed through a magnetic analyser and the corresponding component was led through a collimator on to the covered gas target. After passing through an additional target the deuteron bundle fell on to the target through an opening which was covered with aluminium foil. Before impinging on the counter the α-particles pass through a "long aperture". The target was filled with a gas mixture (pressure 50-56 torr) of He^4 and He^3 with 57,6% He^3. The helium mixture was obtained by successive approximation of the original He-mixture with He^3. The ion flux was measured with a current integrator with immediate connection to the electrically insulated target chamber. By the method of dissociating the complex ions on thin foils it was found that the D_2^+ bundle was without hydrogen ions. The differential cross

KLYUCHAREV, A.P.

SUBJECT USSR / PHYSICS
AUTHOR MAN'KO,V., GAVRILOVSKIJ,B.V., GOLOVNJA,V.JA., KADARZEV,K.V., KLJUCARJEV,A.P.
TITLE The Polarisation of Low Energy Protons on the Occasion of Scattering by Carbon.
PERIODICAL Dokl.Akad.Nauk 111,fasc.1, 59-62 (1956)
Issued: 1 / 1957

CARD 1 / 2 PA - 1971

This work was carried out by means of an electric generator. The scheme of the experiment is illustrated in form of a drawing. The measuring device consists of two vacuum chambers. An electron bundle coming from an electrostatic generator impinges upon the first carbon target M_I in chamber I and the protons scattered on this target are scattered once more on target M_{II} of chamber II. After having thus been scattered twice the protons are now registered by photoplates with an emulsion thickness of 100 . The angle θ_1 on the occasion of the first scattering amounted to 60° in the center of mass system, and for the angle θ_2 of the second scattering the values $\pm 60^\circ$, $\pm 120^\circ$ and $\pm 150^\circ$ in the center of mass system were selected. In connection with each irradiation 6 photoplates with an accordingly selected value of θ_2 were exposed. The solid carbon targets were produced with much care as follows: A nitrocellulose film of from 0,2 to 0,3 thickness was pasted on to a brass ring, and upon this a colloidal graphite solution (aquadag) was poured. After drying the organic base was carefully burned off.

KLYUCHAREV, A.P., and ROSSOMAKHINA, N.Ya.

"The (p,α) reaction at 20 Mev,"

Physical-Tech. Inst. of the Acad. Sci. Ukr SSR

paper submitted at the A-U Conf. Nuclear Reactions in Medium and Low Energy Physics, Moscow, 19-27 Nov 57.

KLYUCHAREV, A. P., LUTSIK, V. A., VAL'TER, A. K., ZALYUBOVSKIY, I. I.

"Gamma-Radiation Produced in Inelastic Scattering by Intermediate Weight Nuclei,"

Physical Technical Inst, Acad. Sci. Ukr SSR

paper submitted at the A-U Conf. on Nuclear Reactions in Medium and Low Energy Physics, Moscow, 19-27 Nov 57.

FEDCHENKO, E. D., KLYUCHAREV, A. P., VANETZIYAN, R. A.

"Elastic Cross Sections for 19,8 Mev Protons Scattered by Co^{59}, Pb^{207}, Pb^{208}, Bi^{209}, U^{238},"

Physical-Technical Inst, Acad. Sci. Ukr SSR

paper submitted at the A-U Conf. on Nuclear Reactions in Medium and Low Energy Physics, Moscow, 19-27 Nov 1957

KLYUCHAREV, A. P.

with Valter, A. K., Zalyubovskiy, I. I. and Lutsik, V. A.
"Les Niveaux d'energie des noyaux moyens."

with Vanetsyan, R. A., and Fedchenko, E. D.
"L'etude des sections efficaces differentielles de diffusion elastique des protons de 19,6 MeV pour les isotopes apparus."

reports presented at the Intl. Congress for Nuclear Interactions (Low Energy) and Nuclear Structure (Intl. Union Pure and Applied Physics) Paris, 7-12 July 1958.

SOV/81-59-24-84747

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 24, p 9 (USSR)

AUTHORS: Klyucharev, A.P., Yal'ter, A.K., Yesel'son, B.N.

TITLE: The Reaction of He^3 With Deuterons

PERIODICAL: Tr. Sessii AS UkrSSR po mirn. ispol'zovaniyu atomn. energii. Kiyev, AS UkrSSR, 1958, pp 64 - 69

ABSTRACT: The measurement of the differential cross section of the reaction He^3 (d, p) He^4 at deuteron energies of 100 - 1,500 kev is reported. α -particles were recorded which escaped under an angle of 90° to the direction of the deuteron beam. The dependence of the cross section on the energy has a resonance course with a maximum at $E_d \approx 435$ kev. The value of the cross section at the maximum is 63.4 mbarn-sterad.

V.R.

Card 1/1

Klyucharev, A P

Translated from: Referativnyy Zhurnal Fizika, 1959, Nr 8, p 67 (USSR) SOV/58-59-8-17415

AUTHORS: Val'ter, A.K., Klyucharev, A.P., Krivets, O.Ye., Samsonov, V.M.

TITLE: Nuclear Reactions Under the Bombardment of Beryllium With He^3

PERIODICAL: Uch. zap. Khar'kovsk. un-t, 1958, Vol 98, Tr. fiz. otd. fiz.-matem. fak., Nr 7, pp 145-151

ABSTRACT: This article investigates the nuclear reactions which take place during the bombardment of beryllium with the nuclei of He^3 at 1.5 Mev energy. A beam of He^{3+} ions, accelerated by means of an electrostatic generator, struck a beryllium target 0.5 μ thick which had been applied to a platinum backing. The products of the reactions were registered on a photographic plate with an emulsion 200 μ thick, which was inclined in such a fashion that it was struck by particles flying out at an angle of 90^0 to the beam of He^3 ions. The spectrogram obtained on the film was plotted by 1,790 tracks. It consisted of a continuous spectrum and a discrete spectrum, consisting of five groups. Several maxima are clearly exhibited on the continuous spectrum. In order to interpret them, emulsions were used which permitted the separation of the α -particles from the

Card 1/2

Translated from: Referativnyy Zhurnal Fizika, 1959, Nr 8, p 67 (USSR) SOV/58-59-8-17416

AUTHORS: Val'ter, A.K., Klymcharev, A.P., Krivets, O.Ye., Samsonov, V.M.

TITLE: Cross Sections for Be^9 (He^3, p) B^{11*} Reactions at 1.5 Mev Energy

PERIODICAL: Uch. zap. Khar'kovsk un-t, 1958, Vol 98, Tr. fiz. otd. fiz.-matem. fak., Nr 7, pp 159-161

ABSTRACT: In order to determine the cross sections for Be^9 (He^3, p) B^{11*} reactions, which correspond to the excitation levels of 7.3, 5.0 and 4.4 Mev of the B^{11} nucleus, a thin beryllium target was bombarded with He^3 ions, accelerated by means of an electrostatic generator up to 1.5 Mev. The charged particles flying out at an angle of 120°, were registered on photographic plates having an emulsion 200 μ thick. The quantity of He^3 ions was determined from the intensity of current in the target, which was measured with an integrator. The total cross sections for the three groups of protons were estimated from the resulting magnitudes of the differential cross sections at an angle of 120° and of the angular distributions of these groups of protons, corresponding to the nuclear

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VAL'TER, A.K.; ZALYUBOVSKIY, I.I. [Zaliubovs'kyi, I.I.]; KLYUCHAREV, A.P. [Kliucharev, O.P.]; LUTSIK, V.P. [Lutsyk, V.P.]

Energy levels of a Zn^{65} nucleus [with summary in English]. Ukr. fiz. zhur. 4 no.1:46-51 Ja-F '59. (MIRA 12:6)

1.Fiziko-tekhnicheskiy institut AN USSR i Khar'kovskiy gosudarstvennyy universitet.
(Zinc--Isotopes) (Nuclear shell theory)

21(7) SOV/89-6-6-10/27

AUTHORS: Vanetsian, R. A., Klyucharev, A. P., Fedchenko, Ye. D.

TITLE: Investigation of the Differential Elastic Scattering Cross Section of 19.6 Mev Protons on Some Separated Isotopes(Issledovaniye differentsial'nogo secheniya uprugogo rasseyaniya protonov s energiyey 19.6 Mev na razdelennykh izotopakh)

PERIODICAL: Atomnaya energiya, 1959, Vol 6, Nr 6, pp 661 - 663 (USSR)

ABSTRACT: The authors report on the measurement of the differential elastic scattering cross sections of 19.6 Mev protons at the separated isotopes Li^6, Li^7, Co^{59}, Cu^{63}, Cu^{65}, Ge^{73}, Ge^{74}, Cd^{111}, Cd^{113}, Cd^{116}, Sn^{116}, Sn^{117}, Sn^{118}, Sn^{119}, Sn^{120}, Sn^{122}, Sn^{124}, Pb^{107}, Pb^{108}, Bi^{209}, U^{238}. A linear accelerator to 20 Mev served as proton source. The scattered protons were recorded by means of two photomultipliers with NaJ(Tl) crystals. The absolute values of the elastic scattering cross sections were measured within an angular range of from 20-160° with an error of ±5%, in the case of relative measurements it was ±3%. The absolute measurements of scattering cross sections are shown by 8 diagrams in

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21(7) SOV/48-23-2-12/20

AUTHORS: Val'ter, A. K., Zalyubovskiy, I. I., Klyucharev, A. P., Krivets, G. Ye., Lutsik, V. A.

TITLE: On the Excitation States of the Nuclei Ga^{67} and Ga^{68} (O vozbuzhdennykh sostoyaniyakh yader Ga^{67} i Ga^{68})

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959, Vol 23, Nr 2, pp 225-227 (USSR)

ABSTRACT: For the study of the lower energy levels Gd^{67} and Gd^{68} the authors investigated the γ radiation which occurs in the reactions $Zn^{66}(p,\gamma)$ Ga^{67}, $Zn^{67}(p,n\gamma)Ga^{67}$ and $Zn^{67}(p,\gamma)Ga^{68}$. The zinc targets used were enriched with Zn^{66} and Zn^{67}. The γ lines determined during proton irradiation of the targets are listed (representation of the spectra in figures 1 and 2). The lines 170, 358, ~850, and 510 kev are caused by reactions of the types $Zn^{66}(p,\gamma)Ga^{67}$, $Zn^{67}(p,n\gamma)Ga^{67}$. The (p,nγ) reaction corresponds to the transition from the secondary excitation state into the basic state; it is a threshold re-

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On the Excitation States of the Nuclei Ga^{67} and Ga^{68}

action. According to these data, a scheme of the lower energy levels of Ga^{67} is given in figure 4. Because of the difficulties of investigating reaction $Zn^{67}(p,\gamma)Ga^{68}$ the authors measured only the upper limit of the γ spectrum in the Ga^{68} decay. It is found at γ quantum energies of 2.05 ± 0.1 Mev. There are 4 figures and 4 references, 3 of which are Soviet.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk USSR, Khar'kovskiy gos. universitet im. A. M. Gor'kogo
(Physico-technical Institute of the Acad. sy of Sciences, UkrSSR, Khar'kov State University imeni A. M. Gor'kiy)

KLYUCHAREV, A.P. (USSR)

"Elastic Scattering of Protons (survey)"

report submitted for the 2nd USSR Conference on Nuclear Reactions at Low and Intermediate Energies, Moscow, 21 - 28 July 1960.

Klyucharev, A.P.

81939

S/120/60/000/03/039/055
E032/E514

21.3200

AUTHORS: Bondar', A.D., Yemlyaninov, A.S., Klyucharev, A.P., Lishenko, V. N. Medyanik, A.D. Nikolaychuk and O. Ye. Shalayeva

TITLE: Preparation of Metal Foils from Pure Isotopes

PERIODICAL: Pribory i tekhnika eksperimenta, 1960, No 3, pp 134-136

ABSTRACT: A summary is given of the various methods which can be used to prepare metal foils of Ni, Cu, Zn, Cd, Co, Mn, Fe, Ag, Cr, Pb, Be, Ge and Zr suitable for use as targets in nuclear scattering experiments. The authors have used three methods for obtaining thin (0.1-10μ) foils, namely, electrolytic deposition, direct evaporation in vacuum,and thermal dissociation. In any of these methods it is important to choose a suitable base which can then be removed, since the foils must frequently be used on their own. The apparatus used in the electrolytic method is shown in Fig 1. In the latter figure 1 is the anode (platinum), 2 is a perspex cylinder, 3 is a copper

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Preparation of Metal Foils from Pure Isotopes

packing, 4 is the cathode, 5 is a copper contact for the cathode and 6 is the base (perspex). This device was used to obtain free foils of Ni, Cu, Zn, Cd, Fe, Pb, Co, Mn, Ag and Cr. The first six of these were obtained both from naturally occurring elements and elements enriched with stable isotopes. The various electrolytes used to obtain the foils are shown in column 3 of the table on p 135. In order to obtain thin foils of Ge isotopes, available in samples of a few tens of mg, the graphite evaporator shown in Fig 2 was employed. The evaporator was mounted directly on the copper leads (2). A tantalum plate 0.1 mm thick was placed above the evaporator at a distance of about 3 cm. In this way a Ge layer 3 to 4 μ thick was obtained from 15 to 20 mg of the isotope. The film was separated from the base by bending the latter. In order to prevent damaging the Ge film, it was covered with a thin layer of varnish. In order to obtain thin foils of Be, a beryllium oxide heater was used, as described by Sinel'nikov in Ref 8. 1 to 2 μ thick Be foils could be obtained in this way. Zr foils 5 to 10 μ thick were

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obtained by the thermal dissociation method. The sample was in the form of ZrI_4 placed in a special sealed ampoule. The compound was dissociated at a hot molybdenum base. The iodine was pumped off and removed by a cold trap, while the Zr was deposited on the molybdenum base. The molybdenum base was then dissolved in nitric acid. The amount of Zr necessary was 30 to 40 mg. The metal films obtained by the above methods were found to be stable during experiments with 5.5, 6.8 and 20 MeV protons. There are 2 figures, 1 table and 10 references, 8 of which are Soviet and 2 English.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN UkrSSR
(Physico-Technical Institute, Ac.Sc., UkrSSR)

SUBMITTED: May 22, 1959

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KLYUCHAREV, A.P.

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E032/E514

21.3200

AUTHORS: Bondar', A.D., Klyucharev, A.P., Lishenko, L.G. and Nikolaychuk, A.D.

TITLE: Preparation of Isotopic Chromium Targets from Cr_2O_3

PERIODICAL: Pribory i tekhnika eksperimenta, 1960, No 3, pp 137-138

ABSTRACT: A new method is reported which can be used to obtain CrI_2 at 300°C in a molybdenum glass container and then convert it into ductile chromium foils. The authors had at their disposal stable isotopes of chromium in samples of about 100 mg each and in the form of Cr_2O_3. In order to transform Cr_2O_3 into the soluble form, the usual method described by Nekrasov (Ref 5) was employed. The chromium was then deposited on an Hg cathode from a 0.1 N sulphuric acid solution. In order to obtain a complete separation of the chromium, a current of 0.75 A was passed for 1.5 to 2 hours. The amalgam obtained in this way was then filtered through chamois leather under vacuum. After removing the surplus mercury the chromium amalgam was placed in the apparatus shown in Fig 1. The

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Preparation of Isotopic Chromium Targets from Cr_2O_3

amalgam was introduced through the tube 7 into the retort 8 and the tube was sealed off. Next, an iodine ampoule 2 was introduced through the tube 5. The block 4 was introduced through the tube 5 in a similar way and the latter was sealed off. The whole assembly was connected to a vacuum pump through the tube 3 and the retort was placed in a furnace in which it was heated up to 200°C. The mercury was driven off from the amalgam into the receiver 1 and the whole apparatus was sealed off at A, while the mercury receiver was sealed off at Б. The block 4 was then used to break the iodine ampoule, the iodine was driven into the retort and the apparatus was sealed off at B. The retort was then heated to 300°C for 30 to 40 min and the chromium iodide obtained was collected in 6. The surplus iodine and mercury iodide was driven into the retort by heating the ampoule 6 up to the knee Д to 300°C. The ampoule containing the chromium iodide was

Card 2/4 sealed off at Г. The ampoule containing the chromium

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E032/E514

Preparation of Isotopic Chromium Targets from Cr_2O_3

iodide was broken under toluene and the chromium iodide together with the toluene was placed in a ceramic crucible lined with molybdenum foil. All the subsequent operations were carried out in a metal vacuum chamber connected to the vacuum pump through a liquid nitrogen trap. The latter condensed all the volatile products such as toluene, iodine etc. The evaporator employed is shown schematically in Fig 2 in which 1 are current leads, 2 are insulators, 3 is a tungsten spiral, 4 is a ceramic crucible, 5 is a molybdenum jacket, 6 is a flange, 7 is the molybdenum lining, 8 is a ceramic crucible, 9 is a molybdenum container and 10 is a holder. After the toluene had been driven off the molybdenum foil base was heated to about 1050°C and the chromium iodide to 800°C. On striking the molybdenum foil the chromium iodide dissociated, the chromium was deposited on the base and the iodine was condensed out by the trap. In this way chromium foils 1 to 15 μ thick

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S/118/60/000/010/005/008
A161/A026

AUTHORS: Petrov, G. A., Mikhaylov, I. N., Klyucharev, A. P., Engineers

TITLE: Automated Heating of Open-Hearth Furnace

PERIODICAL: Mekhanizatsiya i avtomatizatsiya proizvodstva, 1960, No. 10, pp.20-23

TEXT: The article describes in detail the automatic heat control system of a 380-ton open-hearth furnace at Nizhne-Tagil'skiy metallurgicheskiy kombinat (Nizhniy Tagil Metallurgical Combine). The system has been developed by Vsesoyuznyy nauchno-issledovatel'skiy institut metallurgicheskoy teplotekhniki (All-Union Scientific Research Institute of Metallurgical Heat Engineering) in cooperation with the institute "Uralmetallurgavtomatika" and the Nizhniy Tagil Combine. The furnace (as all of the Combine) is laid of basic refractories, it works in scrap-ore process with about 65% liquid iron, burns mixed coke and blast furnace gas, and uses oxygen for boosting; gas is carburated by coal tar during the fusion and the finishing periods. The automatic and interacting control units control the combustion, the operating pressure of the furnace, they reverse the flame and regulate the temperature of the checker work tops. The article includes a diagram of the control system (page 21). The main part of the combustion control unit is

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a pneumatic computer with pneumo-transformers (1, 2, 3, 4, 5, 6) and a proportion regulator РСНЩ-63 (RSNShch-63) that calculates the consumption of all fuel types (and oxygen) and determines the required air quantity for burning with an air excess factor $\alpha = 1.15$. The quantity of carbon monoxide from the bath is not measured. Air feed is corrected automatically by the free-oxygen content in smoke gases analyzed by automatic magnetic gas analyzers (10, 11) МГК-348-ЦЛА (MGK-348-TsLA) "Energochermet", sending commands through an ИР-130-12 (IR-130-12) regulator and a converter (7) into the computer for immediate correction of air feed. Heat loading is controlled by coke gas consumption variations; blast furnace gas consumption is constant; tar consumption is measured by the furnace operator through remote control. The heat loading control includes a coke gas regulator (13) with converter (14) and bellows (15), vault temperature measuring devices (16) and (17), regulators (18) and (19), and devices measuring the checker work top temperature (20) and (21). The coke gas regulator tends to maintain maximum consumption but the correcting devices limit it when the vault temperature reaches 1,720°C, or when the pressure in the furnace exceeds 5 mm water column, or if the blast fan capacity is not sufficient, or the free-oxygen content in smoke is below 5%, or the checker work tops are hotter than 1,300°C. If not limited, the coke gas consumption is determined by the gas line capacity. The pressure

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Automated Heating of Open-Hearth Furnace

control system consists of a remover (22), a regulator (23), an ЭПИД-06 (EPID-06) instrument (19), a servomotor (24) and a gate (25). The control pulse is given from a point in the vault center 2 m away from the front wall. A blocking system prevents overheating; the limit contact is placed in the EPID-06 instrument. When rapid gas separation or some other cause raises the pressure to 5mm water column, the system reduces the heat loading through the bellows. The valves are reversed automatically by an integral time relay (26) - the relay (27) is an emergency relay - and pulse alternation by the temperature of the gas and air regenerators. The reversing system is periodically connected to temperature transmitters (29-32) by a special multicontact relay (28). The maximum temperature of the air regenerator checker tops is limited by a regulator (33) watching the temperature and actuating a gate (34). After the checker tops are cooled down to normal temperature, gas consumption resumes after a time lag (3-4 min) set by a time relay (35). The system provides for a most favourable temperature during the entire heating time. The Tsentral'naya laboratoriya avtomatiki "Energochermet" (Central Automation Laboratory "Energochermet") has devised a method for placing pyrometers directly into the work space through the vault, and this method has been used in the system described, and the indications are more accurate and reliable than with the usual radiation pyrometers on the front and rear wall facing

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the vault. Still, the method takes a great quantity of wires and cables, parts fail frequently, and much cooling water is needed. Tar makes out 6-8% of fuel in the NTMK furnaces, and the control system includes a tar meter of YPMA (UPMA) design. It works smoothly only when the tar flow through its transmitter is constant. The usual Blaw-Noks gates being not suitable because of insufficient speed, rotary non-cooled gates have been used. They are rotated by a crank servo-motor CK-140 (SK-140). The other 380-ton open-hearth furnaces of the NTMK are fitted with automatic control systems similar in principle to the system described, but using different devices. For instance, one furnace has been fitted with units of standard-block system AUC (AUS) of the Moscow "Tiapribor" plant. The AUS system has proved good and is reliable, being handy and requiring less wires and tubes. The automatic control system has been put into constant operation in August 1959. The effect is a furnace output increase of 5 to 5.5%, a fuel consumption cut of 8-9%, and 5% longer service life of furnace lining. There is 1 figure.

Figure 1:

Schematic diagram of automatic control system

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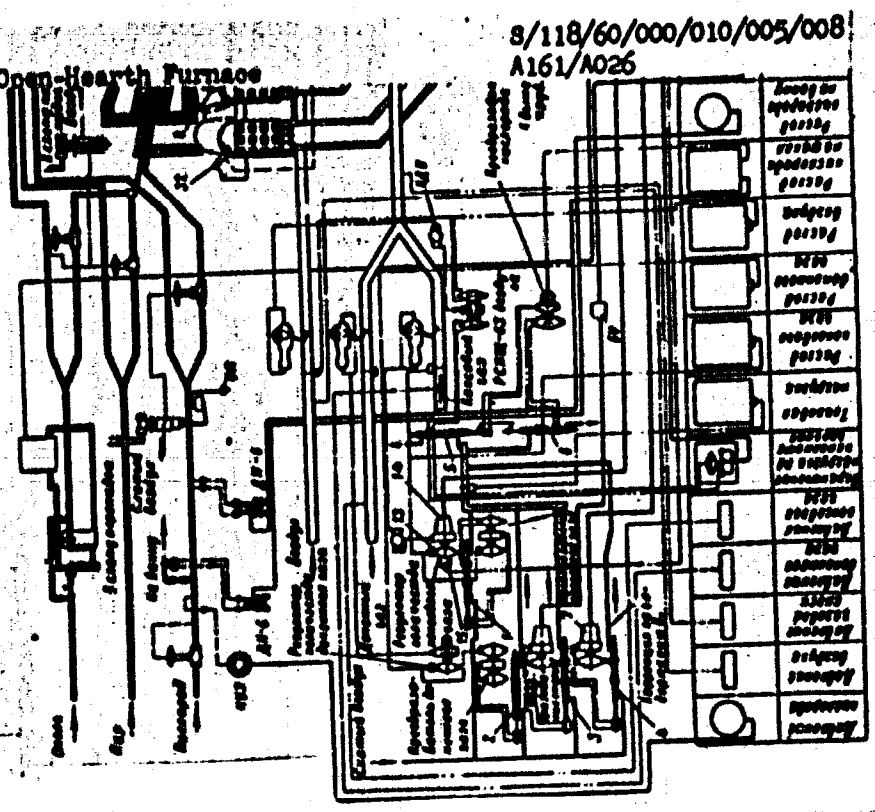
A161/A026

Automated Heating of Open-Hearth Furnace



Card 5/6

VAL'TER, A.K.; ZALYUBOVSKIY, I.I.; KLYUCHAREV, A.P. [Kliucharev, O.P.]; PASICHNIK, M.V. [Pasichnyk, M.V.], PUCHEROV, N.N. [Pucherov, N.M.] CHIRKO, V.I.

Elastic scattering of 6.8 Mev protons on isotopes of chromium, nickel and copper. Ukr. fiz. zhur. 5 no.2:270-272 Mr-Ap '60. (MIRA 13:12)

1. Institut fiziki AN USSR i Fiziko-tekhnicheskiy institut AN USSR.
(Protons—Scattering)

S/048/60/024/007/007/011
B019/B060

AUTHOR: Klyucharev, A. P.

TITLE: The Elastic Scattering of Protons by Atomic Nuclei

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1960, Vol. 24, No. 7, pp. 887-890

TEXT: This is the reproduction of a lecture delivered at the 10th All-Union Conference on Nuclear Spectroscopy held in Moscow from January 19 to 27, 1960. In the author's opinion a complete picture of the scattering of protons on atomic nuclei can be obtained only by studying this effect on separated isotopes. The first studies of this kind were conducted at the Fiziko-tekhnicheskiy institut AN USSR (Institute of Physics and Technology of the AS UkrSSR) (Khar'kov) and are now being continued at ly with the Institut fiziki AN USSR (Institute of Physics and (Kiyev). The proton scattering had been heretofore investigated at proton energies of 5.45 and 6.8 Mev (Refs. 6 to 8) and at 19.6 Mev (Ref. 9) on a great number of isotopes, with a linear accelerator and a cyclotron serving as fast proton sources. The thin-foiled targets were electrolytically

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obtained by evaporating in vacuum and by thermal dissociation in vacuum (Ref. 11). Two important results are pointed out here from among the voluminous material at hand. Fig. 1 graphically depicts the proton scattering by Cd^{111}, Cd^{113}, and Cd^{116} atoms. All the three isotopes have the same diffraction scattering patterns, but Cd^{111} has five energy levels up to 600 kev, Cd^{113} has four, and Cd^{116} has one energy level. The fact that the diffraction patterns were also observable in the range of larger angles convinced the author that the inelastic scattering by Cd isotopes at these energies takes place via a direct interaction, in which the contribution of inelastically scattered protons, as compared with the elastically scattered one, is relatively small in the range of larger angles. Fig. 2 shows the angular dependences of the protons scattered by $_{48}Cd^{116}$ and $_{50}Sn^{116}$. The replacement of two neutrons by two protons causes an appreciable change in the scattering amplitude, while a change of the neutron number by two does not call forth any change in the scattering. From studies made on Cr^{53} with 6.8 Mev protons, and also on Cr^{52}, Ni^{58}, Ni^{60}, Co^{59}, and Cu^{65} at 5.45 Mev the author concludes that a change in the nucleon number in the nucleus by one unit is bound to cause a considerable change in the mode

S/048/60/024/007/011/011
B019/B060

AUTHORS: Bondar', A. D., Yemlyaninov, A. S., Klyucharev, A. P., Lishenko, L. G., Medyanik, V. N., Nikolaychuk, A. D., Shalayeva, O. Ye.

TITLE: The Production of Isotope Targets for Nuclear Research

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1960, Vol. 24, No. 7, pp. 929-933

TEXT: This article is the reproduction of a lecture delivered at the 10th All-Union Conference on Nuclear Spectroscopy held in Moscow from January 19 to 27, 1960. Methods of preparing foils from 16 elements are discussed. The authors used three methods for the preparation of free foils: electrolytic deposition, evaporation in vacuum by heating, and thermal dissociation. The principal characteristics of the three methods are briefly outlined. In the case of the electrolytic deposition, e.g., the selection of the right electrolyte is extremely important, the working conditions play a great part and so does the regeneration of the isotope. In the method of thermal dissociation, an important factor is the selection of the chemical compound

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The Production of Isotope Targets for Nuclear Research

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and the temperature conditions, and as for the evaporation method, material and construction of the vaporizer are very important. Table 1 gives data for the preparation of foils from the elements Ni, Cu, Co, Zn, Cd, Mn, Fe, Ag, Cr, Sn by the electrolytic procedure, and specifies the compositions of electrolytes and the operational conditions in electrolysis. The lead foils were prepared by using 30 - 50 mg of lead, the electrolyte was 25% perchloric acid with an addition of gelatin. In order to obtain a homogeneous Pb deposition, the anode was rotated eccentrically. The preparation of Ge and Be foils by the evaporation method has been described a number of times, but the large isotope losses have never been avoided. With a view to reducing these losses the authors made use of a graphite crucible (Fig. 2), out of which Ge and Be were evaporated onto tantalum. The preparation of foils from other elements by this method is briefly dealt with. Foils of Zr, Ti, and Cr were prepared by thermal dissociation. This method involves the use of volatile compounds of these metals; the apparatus shown in Fig. 3 for the preparation of Zr and Ti iodides is accurately described. To prepare chromium iodide, the authors developed a new procedure. They prepared a paste-like silver chromium amalgam and thence obtained chromium iodide sealed in an ampul with the device shown in Fig. 4 at a temperature

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S/048/60/024/012/011/011
B019/B056

AUTHORS: Bolotin, L. I., Klyucharev, A. P., Kulygin, Yu. F., Ranyuk, Yu. N., Rebutskiy, Ye. I., Rutkevich, N. Ya.

TITLE: Interaction of Carbon Ions With Photoemulsion Nuclei

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1960, Vol. 24, No. 12, pp. 1502-1504

TEXT: The present paper was read at the 10th All-Union Conference on Nuclear Spectroscopy, which was held in Moscow from January 19 to January 27, 1960. A photoplate was bombarded with carbon ions of up to 110 Mev incident at an angle of 25°. The emulsion consisted of light elements (carbon, nitrogen and oxygen), and heavy elements (bromine and silver). Disintegrations with an emission of charged particles (protons, α-particles and heavier fragments) were observed. As it turned out, the star production threshold is near the Coulomb potential barrier of the heavy nuclei and considerably above that of the light nuclei. Only 300 particles of the 1300 charged particles observed in the reaction were simply charged. Most of the reactions proceeded under the emission of a

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KLYUCHAREV, A.P.; RUTKEVICH, N.Ya.

Elastic proton scattering by chromium isotopes at an energy of 5.40 Mev. Zhur. eksp. i teor. fiz. 38 no.1:285-287 Jan '60. (MIRA 14:9)

1. Fiziko-tekhnicheskiy institut AN Ukrainskoy SSR.
(Protons--Scattering) (Chromium--Isotopes)

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S/056/60/038/005/008/050
B006/B070

24.6510

AUTHORS: Val'ter, A. K., Zalyubovskiy, I. I., Klyucharev, A. P., Pasechnik, M. V., Pucherov, N. N., Chirko, V. I.

TITLE: Angular Distributions of 6.8-Mev Protons Elastically Scattered by Chromium-, Nickel-, and Copper Isotopes

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 5, pp. 1419-1423

TEXT: The authors have determined the angular distribution of 6.8-Mev protons elastically scattered by $Cr^{52,53}$, $Ni^{58,60,62}$, and $Cu^{63,65}$. (6.8±0.1)-Mev protons were obtained from the cyclotron of the Institut fiziki AN USSR (Institute of Physics of the AS UkrSSR). The scattered protons were recorded by a scintillation spectrometer which consisted of a CsI(Tl) crystal, a photomultiplier of the type ФЭУ-29 (FEU-29), and a 50-channel pulse-height analyzer of the type АИМА-1 (AIMA-1). Measurements were made between 20° and 160° every 5°, the angles being determined with an accuracy of 0.3°. Depending on the thickness of the target, the energy resolution of the scintillation spectrometer was 4-6%.

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Angular Distributions of 6.8-Mev Protons Elastically Scattered by Chromium-, Nickel-, and Copper Isotopes

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The energy spectrum of the scattered protons was taken for each angle of measurement. The differential scattering cross section was determined in the center-of-mass system. Free films of 3 - 5 μ thickness, enriched in the isotope to be studied to 93-98% served as targets. The compositions of the targets are given in a table. For a majority of the investigated nuclei, the energy resolution of the scintillation spectrometer was adequate to separate the group of inelastically scattered protons from that of elastically scattered protons. One of these energy spectra (Cr^{52}) is shown in Fig. 1. In this spectrum taken at 90° the first level (1.44 Mev) is distinctly marked; this group of protons can be well separated from the elastically scattered protons. The groups of protons related to the excitation of the lowest levels, 0.54 and 1.01 Mev, of the Cr^{53} nucleus can make a significant contribution to the elastic scattering, particularly for large scattering angles, because the high-energy resolution is inadequate. The angular distribution of elastically scattered protons for the two chromium isotopes and E_p = 6.8 Mev is shown in Fig. 2. The first excited states of $Ni^{58,60,62}$ are at 1.44, 1.33, and 1.17 Mev, respectively. The proton groups corresponding to these levels can be easily separated from the group of

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B006/B056

24.6200

AUTHORS: Val'ter, A. K., Zalyubovskiy, I. I., Klyucharev, A. P., Lutsik, V. A.

TITLE: A New Method of Identifying γ-Radiations in the Reactions (p,p'γ), (p,γ), and (p,nγ)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 4(10), pp. 1159 - 1161

TEXT: The investigation of nuclear levels by the bombardment of targets with low-energy protons is rendered difficult by not being able without any difficulty to decide whether the gamma radiation observed is due to a (p,γ), a (p,p'γ), or a (p,nγ) reaction. In the present "Letter to the Editor", the writers first discuss the factors influencing the relative frequency of the individual reactions. Thus, if this is possible from the viewpoint of energy, a gamma radiation accompanied by nucleons is more probable than a pure one, and the existence of the potential barrier, in turn, renders proton emission difficult, so that the reaction (p,nγ) is predominant; besides, the neutron emission probability near the

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A New Method of Identifying γ-Radiations in the Reactions $(p,p'\gamma)$, (p,γ), and $(p,n\gamma)$

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(p,n) threshold grows quickly with the energy of the emitted neutrons, so that the $(p,p'\gamma)$ and (p,γ) reaction yields in certain proton energy ranges above the (p,n) threshold decrease quickly. By an investigation of the gamma yields of each of the observed lines as a function of proton energy in the (p,n) threshold region, it is possible to separate the gamma radiations resulting from the reactions $(p,p'\gamma)$ and (p,γ) of the investigated isotope from those of the admixtures, because it is improbable that the (p,n) thresholds are near to one another. An increase of proton energy beyond the (p,n) threshold causes an excitation of higher levels of the nucleus in the $(p,n\gamma)$ reaction, and each time after a level excitation threshold is exceeded, a decrease of the gamma-radiation intensity of the reactions $(p,p'\gamma)$ and (p,γ) may be observed. The (p,n) thresholds are well known for all stable isotopes, and deviate only little from one another for isotopes of the same element. In order to exclude changes in the gamma yield caused due to various proton capture probabilities on the individual levels of the compound nuclei, the target thickness must be chosen in a particular manner - for medium nuclei about 1 μ. For the purpose of investigating nuclear levels by means of $(p,n\gamma)$ reactions, one proceeds in the opposite order by investigating the dependence of the gamma yield of

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A New Method of Identifying γ-Radiations in the Reactions $(p,p'\gamma)$, (p,γ), and $(p,n\gamma)$

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the reactions $(p,p'\gamma)$ and (p,γ) of the isotope in a large proton-energy range above the (p,n) threshold, thus determining the level excitation thresholds; hereafter, the threshold of the occurrence of gamma radiation from the $(p,n\gamma)$ reaction is determined - both must coincide if the gamma radiation investigated actually originates from the $(p,n\gamma)$ reaction, and corresponds to a transition from the investigated level to the ground state. In this method, the accuracy of level-energy determination is independent of the target thickness. As an example for a successful application of this method, the results obtained by investigating the reactions $Co^{59}(p,n)Ni^{59}$ and $Cu^{65}(p,n)Zn^{65}$ are given and discussed. A figure shows the excitation functions of some 465- and 1330-kev and 770- and 1015-kev lines, respectively. The target thicknesses were 1μ and 5μ, respectively. A number of numerical results are given. There are 1 figure and 2 references: 1 Soviet and 1 US.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk Ukrainskoy SSR (Institute of Physics and Technology of the Academy of Sciences Ukrainskaya SSR)

SUBMITTED: July 18, 1960

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~~21(8)~~ S/020/60/130/05/015/061

AUTHORS: Rutkevich, M. Ya., Golovnya, V. Ya., B013/B014
Val'ter, A. K., Academician of the AS UkrSSR, Klyucharev, A. P.

TITLE: Angular Distribution of 5.45-Mev Protons Scattered Elastically by Nickel-, Copper-, and Cobalt Isotopes

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol 130, Nr 5, pp 1008-1011 (USSR)

ABSTRACT: The present paper describes the determination of this angular distribution with initial proton energies of 5.45 Mev, which is below the potential threshold of the target nuclei by about 1.5 Mev. The protons accelerated to 5.45 Mev by a linac travel through a magnetic analyser with a deflection of 24°, a system of collimating diaphragms, and incide upon a target made of a thin foil, which had been put in a vacuum chamber. The scattered protons were then recorded by photographic plates which were arranged at angles of from 20° to 160° with respect to the incident beam. Nuclear emulsions of the type K NIKFI with a layer thickness of 100 μ were used. Figure 1 illustrates the geometrical arrangement of the experiment. Table 1 gives the

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Angular Distribution of 5.45-Mev Protons Scattered Elastically by Nickel-, Copper-, and Cobalt Isotopes

composition and thickness of the metallic foils which served as targets. The electron flux was measured by means of a beam catcher with a current integrator. Figure 2 shows the energy distribution of protons scattered by Ni^{62} at 140^{0}. The group of elastically scattered protons can be separated reliably from the nonelastically scattered protons. The half-width of the maximum corresponding to the elastically scattered protons is $\pm$ 100 kev. The non-monochromaticity of the primary protons is thus $\pm$ 100 kev at most. The first energy level is above 1 Mev for all even-even nickel isotopes. Co^{59} has its first level at 1.1 Mev and Cu^{65} at 0.77 Mev. The energy spectra of protons scattered by these nuclei indicated the existence of isolated elastic groups. In all cases, the elastically scattered protons could be separated reliably from the total spectrum. Figure 3A shows the angular distribution of protons elastically scattered by cobalt and the isotopes of nickel and copper. Measurements made by various methods (scintillation crystal

Angular Distribution of 5.45-Mev Protons Scattered Elastically by Nickel-, Copper-, and Cobalt Isotopes

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B013/B014

with photomultiplier, photographic camera) yield consistent results. Figure 3B illustrates the angular distribution for a summation of the experimental data, for the three nickel isotopes under consideration, and for naturally-occurring nickel. Figure 4 shows the angular distribution of protons elastically scattered by the nuclei Ni^{58}, Ni^{60}, and Ni^{62}. The height of the maximum and the depth of the minimum are different, and the position of the minimum is markedly shifted toward smaller angles with increasing mass number of the scatterer. The angular distribution of protons scattered by copper and cobalt is qualitatively equal, but at large angles it differs noticeably from the scattering by nickel isotopes. The angular distribution of protons elastically scattered by Cu^{63} is qualitatively similar to that for Cu^{65}. The addition of two neutrons to the nucleus changes scattering as a function of the angle only to a small extent. This is also indicated by results obtained by the authors for nickel, which are, however, insufficient for general conclusions. It is therefore

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Angular Distribution of 5.45-Mev Protons Scattered Elastically by Nickel-, Copper-, and Cobalt Isotopes

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B013/B014

necessary to carry out further experiments on elastic scattering by various nuclei. There are 4 figures, 1 table, and 10 references, 4 of which are Soviet.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk USSR (Institute of Physics and Technology of the Academy of Sciences of the UkrSSR)

SUBMITTED: August 13, 1959

Card 4/4

S/120/61/000/004/020/034
E202/E592

AUTHORS: Bondar', A.D., Karev, V.N. and Klyucharev, A.P.

TITLE: Preparation of thin foils from the isotopic alkali and alkaline earths metals

PERIODICAL: Pribory i tekhnika eksperimenta, no 4, 1961, 136-139

TEXT: The authors describe the preparation of metallic foils of Na, K, Rb, Cs and Li, Ca, Sr, Ba which were used as targets for proton beams of linear accelerators. Two distinct methods are described, viz. by the decomposition of the corresponding azides, and by the reduction of oxides in vacuo with metallic lanthanum powder. For the first method the azides of all the above metals, except lithium, were prepared in an aqueous medium and subsequently evaporated and frozen to prevent the moisture pick-up. Lithium azide was prepared according to the method described by N. Hofman (Ref.7: Bang. Acta chem. scand., 1957, 11, 581). The azides of Na, K, Rb and Cs were decomposed in a sealed glass vessel which was evacuated to approximately 10^{-3} mm Hg, and heated slowly to 150°C. When the decomposition started the heating was terminated, but after its completion the temperature

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[illegible] the authors used another method, based on

the reduction of the corresponding oxides with powdered lanthanum. The procedure of this method closely follows the method used by J. B. Platt and D. H. Tomboulian (Ref.9: Rev Scient.Instrum., 1941, 12, 612) in the preparation of magnesium foils. Calcium foils of 1-5 μ thickness prepared according to the last method from stable isotope enriched carbonate withstood proton irradiation of 5.4 and 6.8 MeV and 10^{-9} - 10^{-10} amp for many hours. There are 2 figures, 3 tables and 9 references: 4 Soviet and 5 non-Soviet. The English-language references read as follows: Ref.2: L.N.Russell, W.E Taylor, J.N.Cooper, Rev Scient.Instrum., 1952, 23, 764; Ref.3: D.H.Randall, M.L.Smith, Nature, 1955, 175, 1041; Ref.9: Quoted in text.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN UkrSSR
(Physico-technical Institute AS UkrSSR)

SUBMITTED: July 18, 1960

S/120/61/000/001/004/062
E032/E114

AUTHORS: Val'ter, A.K., Klyucharev, A.P., and Skakun, N.A.

TITLE: Proton Polarimeters with Reduced Sensitivity to Neutron and Gamma Backgrounds

PERIODICAL: Pribory i tekhnika eksperimenta, 1961, No.1, pp.20-22

TEXT: A description is given of two devices for measuring the polarization of protons at low and intermediate energies. Fig.1 shows a helium polarimeter used by the present authors. Protons whose polarization is to be measured enter from the left through the collimator 2. At the input to the collimator there is a thin aluminium foil 1 which separates the reaction chamber from the helium analyzer. After being scattered in the working volume of the polarimeter, the protons enter the proportional counter 11 through the Venetian blind collimator 4 which was first used by P.V. Sorokin (Ref.1). Slats of the latter collimator are made of copper foils 1 mm thick and set at an angle of 65° to the axis of the polarimeter. The width of this collimator is 20 mm and the distance between the slats is 6 mm. This design leads to an effective increase in the thickness of the

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E032/E114

Proton Polarimeters With Reduced Sensitivity to Neutron and Gamma Backgrounds

gas target and, consequently, in the number of counts. A further increase in the latter number is obtained by increasing the pressure of the helium gas to 10 atm. After passing through the proportional counter the protons enter the caesium iodide crystal (10 in Fig.1) ($10^4 \times 35 \times 1.5$ mm^3) which is in the form of a mosaic made up of separate plates. The light guide 9 is made of perspex and the photomultiplier 8 is at an angle of 30° to the polarimeter axis. Pulses due to a given proton which are recorded by the proportional counter and the photomultiplier are fed into a coincidence circuit. In this way neutron and gamma ray backgrounds are practically excluded. The central photomultiplier 7 (FEU-29) is used to measure the energy of the protons entering the polarimeter and can also be used as a proton monitor. The absolute counting efficiency of the polarimeter for 18 MeV protons is about 10^{-5}. A major advantage of this type of polarimeter is the continuous recording of particles recorded to the left and to the right of the polarimeter axis. The second type of

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E032/E114

Proton Polarimeters With Reduced Sensitivity to Neutron and Gamma Backgrounds

polarimeter is shown in Fig.3. In this polarimeter the protons are scattered at 45° at a solid carbon target 4 and enter a cylindrical proportional counter 8 and then the caesium iodide crystal 7. The latter crystal is in the form of a disc (32 mm diameter, 2 mm thick). The working gas in the proportional counters is argon. Pulses from the proportional and scintillation counters are fed into a coincidence circuit which again excludes neutron and gamma backgrounds. Whereas in the helium polarimeter the polarization due to the analyzer can be calculated (J.L. Gammel and R.M. Thaler, Ref.3), in the case of the carbon target a calibration is necessary. This is the major disadvantage of this instrument. However, the carbon polarimeter has a much better energy resolution and the polarization in $p\text{-}C^{12}$ elastic scattering has a large value at 45°, in wide energy interval. The polarimeters have been built for use in experiments on the He^3 (d, p) He^4 reaction.
There are 3 figures and 5 references: 2 Soviet and 3 non-Soviet.
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E032/E114

Proton Polarimeters With Reduced Sensitivity to Neutron and Gamma Backgrounds

ASSOCIATION: Fiziko-tekhnicheskiy institut AN USSR
(Physico-technical Institute, AS Ukr.SSR)

SUBMITTED: December 19, 1959

Card 4/6

S/120/61/000/002/036/042
E032/E114

AUTHORS: Bondar', A.D., Karev, V.N., and Klyucharev, A.P.

TITLE: Preparation of isotopic magnesium foils from magnesium oxide

PERIODICAL: Pribory i tekhnika eksperimenta, 1961, No.2, pp.177-178

TEXT: Russell et al. (Ref.3) have described a method for the preparation of isotopic magnesium. The present authors suggest that this method suffers from the disadvantage that the magnesium specimen contains magnesium oxide and tantalum impurities. Moreover, it cannot easily be used to obtain relatively thick targets, or targets in the form of a pure magnesium foil. The present authors use the following method: 100-150 mg of the isotopic magnesium oxide and 250-400 mg of lanthanum are ground down until the grain size is of the order of 1 mm. They are then inserted in layers into the crucible shown in Fig.1. The crucible contains a filter 3 which is prepared from molybdenum shavings. The crucible is then inserted into the furnace 5 (Fig.2). The reduction and evaporation of magnesium is carried out in the vacuum system shown in Fig.2 (at pressures at

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S/120/61/000/002/036/042
E032/E114

Preparation of isotopic magnesium foils from magnesium oxide 10^{-5} - 6 x 10^{-6} mm Hg). Temperatures of the order of 700-1300 °C are necessary and the reaction times involved range from a few minutes to a few hours, depending on the form of the original materials employed. The reduced metallic magnesium is collected on the target 1 which is cooled by liquid nitrogen. Owing to the intensive cooling of the target the magnesium foil is frequently found to crack. In order to obtain a continuous foil the magnesium is again evaporated from the same furnace on to the uncooled target. Depending on the amount of metal employed and the distance to the target, 2 - 60 μ foils can be obtained by this method. The target is in the form of a polished tantalum foil. The target surface is carefully rubbed with ceresin and finally with soft cotton. Magnesium foils can then be separated from the target with the aid of a razor blade. Foils having a thickness of less than 5 μ can be removed by immersing the target in water or alcohol. The reduction and evaporation process is very dependent on the absence of oxidizing impurities. These can be removed with the aid of hydrogen or some

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S/120/61/000/002/036/042
Preparation of isotopic magnesium .. E032/E114

other reducing agent.
There are 2 figures and 8 references: 7 Soviet and 1 English.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN USSR
Physico-technical Institute, AS Ukr.SSR)

SUBMITTED: April 2, 1960

Fig.1

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VAL'TER, A.K.; ZALYUBOVSKIY, I.I.; KLYUCHAREV, A.P.; LUTSIK, V.A.

Cu^{64} levels excited in the reaction $Ni^{64}(p, n\gamma)$ Cu^{64}.
Izv. AN SSSR. Ser. fiz. 25 no.9:1127-1130 '61. (MIRA 14:8)

1. Fiziko-tekhnicheskiy institut AN USSR.
(Niobium—Isotopes)
(Copper—Isotopes)
(Nuclear reactions)

VANETSIAN, R.A.; KLYUCHAREV, A.P.; TIMOSHEVSKIY, O.F.; FEDCHENKO, Ye.D.

Calculating the cross sections of elastic scattering for 5.45 Mev. protons according to the optical nuclear model. Zhur. eksp. i teor. fiz. 40 no.4:1199-1202 Ap '61. (MIRA 14:7)
(Nuclear models) (Protons--Scattering)

GOLOVNYA, V.Ya.; KLYUCHAREV, A.P.; SHILYAYEV, B.A.

Elastic scattering of 5.45 mev. protons on zirconium nuclei. Zhur. eksp.i teor.fiz. 41 no.1:32-34 Jl '61. (MIRA 14:7)

1. Fiziko-tekhnicheskiy institut AN Ukrainskoy SSR.
(Protons—Scattering) (Zirconium)

VAL'TER, A.K.; ZALYUBOVSKIY, I.I.; KLYUCHAREV, A.P.; LUTSIK, V.A.; ORLENKO, B.F.; PASECHNIK, M.V.; PROKOPENKO, V.S.; PUCHKOV, N.N.

Angular distribution of 6.8 mev. protons elastically scattered on nickel and zirconium isotopes. Zhur.eksp.i teor.fiz. 41 no.1:71-74 Jl '61. (MIRA 14:7)

1. Institut fiziki AN Ukrainskoy SSR i Fiziko-tekhnicheskiy institut AN Ukrainskoy SSR.
(Protons--Scattering) (Nickel--Isotopes) (Zirconium--Isotopes)

S/903/62/000/000/010/044
B102/B234

AUTHOR: Klyucharev, A. P.

TITLE: Elastic scattering of protons from atomic nuclei

SOURCE: Yadernyye reaktsii pri malykh i srednikh energiyakh; trudy Vtoroy Vsesoyuznoy konferentsii, iyul' 1960 g. Ed. by A. S. Davydov and others. Moscow, Izd-vo AN SSSR, 1962, 148-152

TEXT: The author discusses the results of a great many investigations dealing with elastic scattering of protons from targets of natural isotope composition. The experimental data indicate that the angular distributions in elastic scattering depend mainly on whether the target nucleus has an even or odd Z. Then a review is given on own measurements carried out in the years after 1955 on the linear accelerators of the Fiziko-tekhnicheskiy Institut AN USSR (Physicotechnical Institute AS UkrSSR) in Khar'kov and on the cyclotron of the Institut fiziki AN USSR (Institute of Physics AS UkrSSR) in Kiyev. The proton energies were 5.4, 6.8 or 19.6 Mev. Details of these investigations were published in Atomnaya energiya, 6, 661, 1959 and ZhETF, 38, 1419, 1960. Results on experiments carried out with separate isotopes,

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S/903/62/000/000/010/044
B102/B234

Elastic scattering of protons...

namely Ca^{40}, $Cr^{52,53}$, $Ni^{58,60,62,64}$, Cu^{65}, $Zn^{64,68}$ are here dealt with in brief and conclusions are drawn as to parity effects and low-energy proton scattering characteristics. Special attention is paid to the relation between (p,n)-reaction thresholds and elastic proton scattering angular distributions. For 25 isotopes the calculated values of these thresholds are compared with experimental values (Helv. Phys. Acta, 24, 3, and 441, 1951); agreement is good. These data show that nuclei with odd Z and nuclei with even Z but high neutron excess have low thresholds, nuclei with even Z but low neutron excess have high thresholds. The laws governing the angular distributions show a certain parallelism. The anomalous increase of $\sigma(\Theta)/\sigma(\Theta)_{Rh}$ at large angles for nuclei with even Z is found to be due to elastic scattering with compound nucleus formation. There are 2 figures and 1 table.

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S/903/62/000/000/015/044
B102/B234

AUTHORS: Bolotin, L. I., Klyucharev, A. P., Rutkevich, N. Ya., Revutskiy, Ye. I., Rudyak, B. I.

TITLE: Angular distributions of 5.4-Mev protons elastically scattered from Ca, Ni and Zn isotopes

SOURCE: Yadernyye reaktsii pri malykh i srednikh energiyakh; trudy Vtoroy Vsesoyuznoy konferentsii, iyul' 1960 g. Ed. by A. S. Davydov and others. Moscow, Izd-vo AN SSSR, 1962, 180-184

TEXT: Elastic proton scattering was investigated with even-even isotopes exhibiting great differences in their neutron numbers: Ca^{40} and Ca^{48}, Ni^{58} and Ni^{64} and Zn^{64} and Zn^{68}. The protons were accelerated with a linear accelerator to 5.40 Mev and were, after scattering, recorded by photographic plates arranged about the incident beam in the interval 20-160°C. The targets were thin foils (1.12 - 3.0 μ) enriched in the isotope to be investigated. The angular distributions of the protons were measured and are represented in a plot with $\Theta_{c.m.s.}$ as abscissa and

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S/903/62/000/000/015/044
B102/B234

Angular distributions of...

$[N(\theta)/N(120^\circ)]/[(\sin\theta/2)^4/(\sin 60^\circ)^4]$ as ordinate. The ratio at 160° between the measured cross section and the Coulomb cross section is, for Ca^{48}, smaller by a factor of 2.5 than for Ca^{40}; for Ni^{64} smaller by a factor of 1.9 than for Ni^{58}; and for Zn^{68} smaller by a factor of 1.3 than for Zn^{64}. The large-angle maxima may be explained by a considerable contribution of scattering with compound-nucleus formation. The possible decay channels are (p,n), (p,p), (p,p'), (p,α) and (p,γ), the two latter are of little probability. The (p,n) reaction thresholds were also determined. They were 15.0 and 0.52 for $Ca^{40,48}$, 10.48 and 2.45 for $Ni^{58,64}$ and 8.0 and 3.81 for $Zn^{64,68}$, i.e. for even isotopes they decrease with increasing neutron number. There are 5 figures.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN USSR (Physicotechnical Institute AS UkrSSR)

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S/903/62/000/000/017/044
B102/B234

AUTHORS: Val'ter, A. K., Vanetsian, A. A., Klyucharev, A. P., Timoshenskiy, O. F., Fedoro..o, Ye. D.

TITLE: Calculation of the differential elastic scattering cross sections of 6.8-Mev protons for nuclei of some Ni, Cu, and Cr isotopes on the basis of the optical model of the nucleus

SOURCE: Yadernyye reaktsii pri malykh i srednikh energiyakh; trudy Vtoroy Vsesoyuznoy konferentsii, iyul' 1960. g. Ed. by A. S. Davydov and others. Moscow, Izd-vo AN SSSR, 1962, 191-200

TEXT: To gather information for the choice of optimum parameters and on the differential scattering cross sections obtained with these parameters in the case of agreement with experiment, optical-model calculations were carried out for $Cr^{53,58}$, $Ni^{60,62}$, and $Cu^{63,65}$ for E_p = 5.45, 6.8 and 19.6 Mev, which gives the possibility of obtaining the energy dependence of the parameters. The experimental data needed were taken from Atomnaya energiya, 6, 661, 1959, ZhETF, 38, 1419, 1960, and DAN SSSR, 130, 1009, 1960. The calculations

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are made in the usual manner with the potential ansatz

$$V^{sl}(r) = V_{кул}(r) + V_0 \frac{1}{1+e^{\frac{r-r_{00}}{a_0}}} + iW_0 e^{-\left(\frac{r-r_0}{b_0}\right)^2} - \chi\left(\frac{\hbar}{\mu c}\right)^2 \frac{1}{r}\frac{dI}{dr} V_{so}(sl), \quad (3)$$

$$(sl) = \begin{cases} l & \text{для } j = l + \frac{1}{2}, \\ -(l+1) & \text{для } j = l - \frac{1}{2}, \\ 0 & \text{для } l = 0. \end{cases}$$

where $V_{кул}(r)$ is the Coulomb potential. Agreement was best when the following parameters were used:

	r_0	a	b	V_0	W_0	V_{so}
O^{16}	1,23	0,38	0,60	64,7	7,6	92
Ni^{58}	1,23	0,36	0,73	68,3	6,6	94
Ni^{60}	1,23	0,37	0,74	68,0	6,5	93
Cu^{63}	1,23	0,46	0,94	64,0	5,6	53
Cu^{65}	1,23	0,46	0,95	63,0	5,5	62
	1,23	0,43	0,85	64,2	5,1	90

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Calculation of the differential...

Conclusions: The position of the extrema in the $\sigma(\theta)$ curve is mainly determined by the two parameters V_0 and r_0 which are interrelated by $V_0 r_0^2$=const. Any change of these parameters affects not only the position but also the amplitude of the extremum. When V_0 and r_0 are increased the extremum becomes shifted to smaller angles θ. A variation of a corresponds to rotation of the angular distribution around θ=0°; increasing of a means rotation in the negative sense. Reduction of b shifts the extrema toward larger θ and raises their amplitude, particularly at large θ. W influences only the height of the extrema. Any alteration of the spin-orbital potential V_s causes a distortion of the angular distribution especially for $\theta \geq 120°$C. There are 11 figures and 1 table.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN USSR (Physicotechnical Institute AS UkrSSR)

Card 3/3

S/903/62/000/000/025/044
B102/B234

AUTHORS: Klyucharev, A. P., Rutkevich, N. Ya., Ranyuk, Yu. N., Bolotin, L. I., Kulygin, Yu. P., Revutskiy, Ye. I.

TITLE: Nuclear reactions induced by heavy ions

SOURCE: Yadernyye reaktsii pri malykh i srednikh energiyakh; trudy Vtoroy Vsesoyuznoy konferentsii, iyul' 1960 g. Ed. by A. S. Davydov and others. Moscow, Izd-vo AN SSSR, 1962, 329-333

TEXT: Nuclear photoemulsions НИКФИ (NIKFI)(type D) were irradiated by carbon (112 Mev) and beryllium ions (84 Mev) and then subjected to microscopic scanning. On the average 2200 Be ions (or 4400 C ions) were necessary for producing one star. A total of 130 stars due to Be and of 140 due to C ion bombardment were analyzed. The events may be attributed to two groups: collisions with light (C,N,O,H) and heavy (Br,Ag) nuclei, and among them to three groups: production of singly-, doubly, or multiply charged particles. Since it was not possible to identify the prongs the stars were analyzed on the basis of the particle evaporation from compound nuclei. The reaction products were alphas and protons with $\alpha/p = 10$ for light and $\alpha/p \gtrsim 20$ for heavy nuclei. For C, N, O + C the main reactions were

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Nuclear reactions induced by heavy ions

2α, 3α, p2α, αp, and α (enumerated according to decreasing probability) and for Br, Ag + C they were α, α, αp, 3α, p, p2α; for C, N, O + Be they were 2α, α, 3α, pα and 5α (the latter two with equal probability) and for Br, Ag + Be 2α, α, 2pα, p. Also energy spectra and angular distributions were measured. The course of the latter indicates the considerable contribution made by direct processes. It could be shown that the six-pronged stars observed were formed by α-particles, the disintegration products of the carbon projectile. There are 7 figures.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN USSR (Physicotechnical Institute AS UkrSSR)

L 10601-66 EWT(m)/EWP(w)/EPF(n)-2/EWA(d)/T/EWP(t)/EWP(z)/EWP(b)/EWA(h)
ACC NR: AT5023822 MJW/JD/GG/GS SOURCE CODE: UR/0000/62/000/000/0374/0381

AUTHOR: Strel'nikov, P. I.; Fedorenko, A. I.; Klyucharev, A. P.

ORG: none

TITLE: Effect of irradiation with protons on the microhardness of iron and steel

SOURCE: Soveshchaniye po probleme Deystviye yadernykh izluchenly na materialy. Moscow, 1960. Deystviye yadernykh izluchenly na materialy (The effect of nuclear radiation on materials); doklady soveshchaniya. Moscow, Izd-vo AN SSSR, 1962, 374-381

TOPIC TAGS: irradiation, proton irradiation, rion, carbon steel, microhardness, iron microhardness, carbon steel microhardness/U8 steel, U10 steel, U12 steel, armco iron

ABSTRACT: The effect of proton irradiation on the microhardness of iron and steel has been studied. Specimens of as-supplied Armco iron and of U8, U10, and U12 carbon steels with thicknesses much greater than the depth of proton penetration, were irradiated in vacuum at 60—80C with different integrated proton fluxes with energies between 0.89 and 1.4 Mev, and subjected to microhardness tests. It was found that irradiation with an integrated flux of 1.62×10^{19} proton/cm^2 at 1.25 Mev substantially increases the steel microhardness, especially in the layer close to the specimen surface. To determine the effect of the irradiation dosage on microhardness, U12 steel was irradiated with integrated fluxes of 4.12×10^{8} and

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Card 2/2

KLYUCHAREV, A. P.

S/185/62/007/004/007/018
D407/D301

AUTHORS: Vanetsian, R. A., Klyucharyev, A. P., Tymoshevs'kyy, H. F., and Fedchenko, Ye. D.

TITLE: Calculating elastic scattering of protons with energy of 19.6 Mev according to the optical model

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 7, no. 4, 1962, 378-381

TEXT: The differential cross-sections of elastic scattering of protons (with energy of 19.6 Mev) by nuclei of the separated isotopes Co^{59}, Cu^{65}, Cd^{116}, Sn^{116}, Sn^{124} are calculated. The optical model was used, spin-orbit coupling being taken into account. The real part of the potential was taken in Saxon's form, the imaginary part--in Gaussian form. The results of the calculations show that for scattering angles between 20 - 40°, no satisfactory agreement with experiment could be obtained.

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Calculating elastic...

All attempts to improve the agreement between calculated and experimental values were in vain. Agreement was good only for Co^{59} for the entire angular interval, except at small angles. On the other hand, for Cu^{65} considerable discrepancies occurred even at angles exceeding 135^0. The experimental values (for all the isotopes under investigation) were much higher than the calculated ones. The shape of the angular distribution of elastically scattered protons with energy 19.6 Mev was more complex than that of protons with 5.45 and 6.8 Mev. The angular distribution curves for Co^{59} protons, calculated by means of the Gaussian form of the imaginary potential on the one hand, and by Saxon's form on the other, differed greatly for large scattering angles. The use of Saxon's form for the imaginary part of the potential does not yield good agreement with experiment for any of the nuclei under investigation. The parameters of the optical model differ greatly for heavy and light nuclei;

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KLYUCHNIKEV, A F

S/185/62/007/004/008/018
D407/D301

AUTHORS: Skakun, M. O., Val'ter, A. K., and Klyucharyev, A. P

TITLE: Proton polarization in $D(d,p)H^3$-reaction

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 7, no. 4, 1962, 383-385

TEXT: Proton polarization in the $D(d,p)H^3$-reaction was determined by measuring the asymmetry of elastically scattered protons by helium. The protons were recorded by means of a telescope incorporating a proportional counter and a photomultiplier. In the present work, a method is used whereby the background is considerably reduced. This method involves application of a paraffin coating 25 cm thick. The experimental procedure is described. The degree of polarization P_1 for particles with spin 1/2 was determined by measuring the azimuthal asymmetry R of elastically scattered protons, by means of the

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S/185/62/007/004/008/018
D407/D301

Proton polarization in...

formula

$$R = \frac{1 + P_1 P_{an}}{1 - P_1 P_{an}},$$

where P_{an} is determined by the geometry of the analyzer. The angle of elastic scattering was 90^0, and $P_{an} = 0.39$. The results of the measurements are listed in a table. With energies of 0.72, 1.10, and 1.48 Mev, the degree of polarization was found to be $-17 \pm 8\%$, $-18 \pm 9\%$, and $-15 \pm 9\%$ respectively. A comparison with the results of other investigators showed good agreement. There are 1 figure, 2 tables and 11 references: 3 Soviet-bloc and 8 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: McCormac, Steuer and Hereford, Phys. Rev., 104, 718, 1956; B. Maglic, Nuclear Physics, 6, 449, 1958; R. Segel and S. Hanna, Phys. Rev.,

Card 2/3

KLYUCHAREV, A.P. [Kliucharev, O.P.]; MIKOLAYCHUK, A.D.; NAZAROVA, T.S.

Production of hafnium and germanium foil for nuclear research.
Ukr. fiz. zhur. 7 no.9:1027 S '62. (MIRA 15:12)

1. Fiziko-tekhnicheskiy institut AN UkrSSR, Khar'kov.
(Hafnium) (Germanium)

KLYUCHAREV, A.P. [Kliucharev, O.P.]; ORLENKO, E.F.; PROKOPENKO, V.S.; PUCHEROV, N.N. [Pucherov, M.M.]

Scattering of 6.9 Mev. protons by Mg^{24}. Ukr. fiz. zhur. 7 no.9:1020 S '62. (MIRA 15:12)

1. Institut fiziki AN UkrSSR, Kiyev.
(Protons—Scattering) (Magnesium)

S/032/62/028/012/004/023
B124/B101

AUTHORS: Bondar', A. D., Karev, V. N., Klyucharev, A. P., and Nikolaychuk, A. D.

TITLE: X-ray spectrum analysis of thin metal foils

PERIODICAL: Zavodskaya laboratoriya, v. 28, no. 12, 1962, 1446 - 1448

TEXT: Non-destructive determination of impurities in thin titanium, chromium, and zirconium foils was carried out by X-ray spectrum fluorescence analysis. The foils were obtained by decomposing the corresponding iodides on a molybdenum base which was then dissolved in nitric acid. Molybdenum diffuses into the foils at 1050 - 1250°C. Specimens of 20 mm diameter resulting from vacuum metallization of molybdenum on an aluminum film were used as external standards. If the foils are 1 μ the molybdenum content can be found directly on the calibration curve. If the molybdenum distribution is irregular, it can be determined approximately by irradiation from both sides. If the total impurity forms a thin layer on one side of the foil, then $I_2' = I_0 e^{-\mu_1 f}$ (2)

Card 1/2

X-ray spectrum analysis ...

with $A = \left(\frac{1}{\sin\beta_1} + \frac{1}{\sin\beta_2}\right)$, and $\mu = \mu_0$, holds approximately for the reduction in absorption of the MoK_α radiation from the other side. I_0 is the intensity of MoK_α-radiation on the side where the base is, μ_2 is the mass coefficient of absorption of the foil for characteristic X-rays, β_1 and β_2 are the angles between the foil surface and the primary and characteristic rays respectively, and ρ is the surface density of the foil in $\mu g/cm^2$.

If molybdenum is distributed on the surface, $I_1' = I_2 e^{\mu_1}$ (5)

is obtained on the assumption that the experimental value I_2 is given by reducing any intensity I_1'. The actual molybdenum value corresponds best with the mean value of I_1 and I_1'. There are 1 figure and 2 tables. The most important English-language reference is: P. D. Zemany, H. A. Leibhafsky, J. Electrochem. Soc. 103, 157 (1956).

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk USSR (Physico-technical Institute of the Academy of Sciences UkrSSR)

Card 2/2

S/032/62/028/012/005/023
B104/B186

AUTHORS: Karev, V. N., Klyucharev, A. P., and Medyanik, V. N.

TITLE: Determination of the thickness of metal foils from the change in intensity of the characteristic X-radiation

PERIODICAL: Zavodskaya laboratoriya, v. 28, no. 12, 1962, 1449-1451

TEXT: Two methods of determining the thickness of metal foils are compared. In the first method, the thickness is determined from the increase in intensity of the characteristic X-radiation with the growing thickness of a foil or coating when irradiated by a primary X-ray beam. In this case $I_d = I_\infty (1 - \exp(ad))$, where I_∞ is the intensity of the characteristic X-radiation from an infinitely thick layer, $a = -\left(\frac{\mu_1}{\sin\beta_1} - \frac{\mu_2}{\sin\beta_2}\right)$. μ_1 and μ_2 are the mass absorption coefficients for primary and secondary emission of the foil, β_1 and β_2 are the angles between the sample surface and the primary and fluorescing rays, respectively. d is the thickness. In the

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Determination of the thickness of...

second method, the thickness of the foil (coating) is determined from the decrease in intensity of the characteristic radiation of the backing when the thickness of the foil increases. In this case $I = I_0 \exp(ad)$, where I_0 is the intensity of the characteristic radiation from the backing without foil (coating). Here, μ_1 and μ_2 are the mass absorption coefficients of the coating material for the primary X-ray beam and for the characteristic radiation of the backing. The thickness of Cr, Co, Ni, and Zn foils was determined using a Blokhin fluorescence X-ray spectrometer (M. A. Blokhin, V. P. Volkov, Zavodskaya laboratoriya, XXVII, 9, 1110, 1960) with a bent quartz crystal (R = 400 mm). The first method proved better for thin samples, the second for thick samples. For very thin samples the linear relation $I_d = I_\infty ad$ holds for the first method. When $d > d_c$, I_d will no longer depend on the thickness of the sample. $d_c = 0.25\mu$ for nickel and 0.3μ for zinc. As $\mu_{mean} \approx \mu_{1,2}$ for the second method, the thickness can be determined with sufficient accuracy from the formula

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34637
S/056/62/042/002/017/055
B102/B138

24.6210

AUTHORS: Remayev, V. V., Gritsyna, V. T., Klyucharev, A. P.

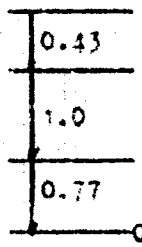
TITLE: The new shortlived isomers Nd^{140m}, Pm^{141m}, Eu^{146m} and Gd^{159m}

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 2, 1962, 408-415

TEXT: Of eight rare-earth oxides irradiated with protons of 20.8 ± 0.25 Mev, PrO_4, Sm_2O_3 and Gd_2O_3 were found to form shortlived activities of 10^{-4}-10^{-1} sec halflives. The method of measurement was similar to that described by A. M. Morozov, V. V. Remayev and P. A. Yampol'skiy (ZhETF, 39, 973, 1960). The spectrometer, consisting of a NaI(Tl) crystal, a broad-band amplifier and a single-channel pulse-height analyzer, had a time resolution of 1 μsec. The halflife measurements were made with a 25-channel time analyzer, the proton energy was determined in Al absorption tests, and by using the $C^{12}(p,n)N^{12}$ reaction as threshold indicator (E_{thr} = 19.9 Mev). PrO_4 displayed three photopeaks corresponding to gamma

Card 1/3

transitions with 1.00, 0.77, and 0.435 Mev (±0.02 Mev), the halflife of the isomeric activity was 0.6 ± 0.05 msec. The reaction threshold was at about 10 Mev and the isomer production reaction was found to be $Pr^{141}(p,2n)Nd^{140m}$. The most probable Nd^{140m} decay scheme is the following:



Nd_2O_3 was investigated in natural composition and enriched in Nd^{142} up to 98.5 %. The gamma spectrum had two peaks: 0.19 and 0.43 Mev (± 0.01 Mev), the reaction threshold was 8.5 ± 1 Mev. The isomeric state was found to be produced in the reaction $Nd^{142}(p,2n)Pm^{141m}$. The relative intensity of both the transitions was $N_{0.19}/N_{0.43}$ = 1.6 ± 0.3, the 0.43-Mev transition is most probably an M3 one. In Sm_2O_3 the short halflife was 0.24 ± 0.01 msec. The spectrum is complex and shows peaks at 0.24, 0.28, 0.36, 0.39, and 0.48 Mev. For the threshold of ~10 Mev obtained, the reaction $Sm^{147,m}(p,2n)Eu^{146m}$ is most probable. Gd_2O_3 shows two peaks at 0.08 and 0.18 Mev (± 0.01 Mev) and a halflife of 0.46 ± 0.02 msec. The threshold was at 16.5 ± 0.5 Mev, indicating the

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S/056/62/043/003/006/063
B125/B102

AUTHORS: Klyucharev, A. P., Rutkevich, N. Ya.

TITLE: Elastic scattering of 5.45-Mev protons by Mg isotopes

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 3(9), 1962, 775 - 776

TEXT: The angular distribution of 5.45-Mev protons scattered from Mg targets was studied by the same methods as in the paper of N. Ya. Rutkevich et al. (DAN SSSR, 130, 1009, 1960). The targets, free foils of a thickness of 3 μ, were enriched in 99.7% Mg^{24}, 90.6% Mg^{25}, and 93% Mg^{26}, respectively. For Mg^{25} the total spectral distribution of the protons was taken and the group comprising elastically scattered particles was separated. From 20° to 160° (c.m.s) the quantity $[N(\vartheta)/N(20^\circ)]/[\sin(\vartheta/2)/\sin 10^\circ]^4$ for Mg^{25} and Mg^{26} increases slowly and after that more rapidly in a qualitatively similar way. For Mg^{24} this quantity rapidly increases from ~60° to ~80°, remains constant up to ~120°, and beyond 120° again increases rapidly. The elastic scatterings

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B102/B180

AUTHORS: Berezhnoy, Yu. A., Alyucharev, A. P., Ranyuk, Yu. N., Rutkevich, N. Ya.

TITLE: Total nuclear disintegration reactions

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 4(10), 1962, 1249 - 1252

TEXT: In order to study the peculiarities of the alpha-group structure of light nuclei, the reaction $C^{12}+C^{12} \rightarrow 6\alpha$ was investigated with 300-400 μ НИКФИ-Д(NIKFI-D) photographic emulsions bombarded by carbon ions from the linear accelerator of the Khar'kovskiy fiziko-tekhnicheskiy institut (Khar'kov Physicotechnical Institute). Besides the alpha-particle energy and angular distributions, the excitation function (Fig. 4) was also measured from the threshold (designated by ▽) up to 115 Mev (laboratory system). The angular distribution of the alphas, given by $dn/\sin\vartheta d\vartheta = f(\vartheta)$ is symmetrical with a flat minimum at 90°, the energy distribution, $dn/dw = f(w)$, is shown in Fig. 3. These functions are calculated with the statistical model of

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Total nuclear disintegration ...

direct nuclear disintegration.

$$2\pi \sin\theta d\theta = \frac{N_0 e^{-u}}{\sqrt{2\pi}\,\Gamma(3/4,\, u)} \int_0^{\pi/2} \exp\left(x(1+\cos^2\theta)\right) I_0(x\sin^2\theta)\, x^{1/4}\, dx. \quad (6)$$

and

$$\frac{dn}{dw} = \frac{2\alpha N_0 \mu e^{-u}}{\sqrt{\pi}\,\Gamma(3/4,\, u)}\, e^{-\alpha w} \int_0^{\pi/2} \mathrm{sh}\left(\sqrt{\frac{w}{\varepsilon}}\sin x\right)\cos^2 x\, dx, \quad (7)$$

are obtained using the notations from Fig. 5 and $N_0 = \int dn$, $u = \mu\beta^2 R^2/2\alpha$, μ is the α-particle mass, $w = p^2/2\mu$ its energy and $m_z = p\rho\sin\theta\cos(\varphi - \varphi)$ its angular momentum. The phenomenological constants α and β are determined from the total energy and the total momentum

$$E_0 = \frac{N_0\mu\,\Gamma(5/4,\, u)}{2\alpha\,\Gamma(3/4,\, u)}, \quad M_0 = \frac{2N_0\mu}{\beta}\left[1 - \frac{\Gamma(5/4,\, u)}{u\,\Gamma(3/4,\, u)}\right]. \quad (4)$$

with $\Gamma(a, b) = \int_0^b e^{-x} x^{a-1}\, dx$.

$E_0 = \int w\, dn$, $M_0 = \int m_z\, dn$; $\varepsilon = \alpha w/4$, R is the radius of the effective volume. From the measurements $N_0 = 6$, $E_0 = 36$ Mev $M_0 \approx 15\,\hbar$ and R = 5f were found, so that with (4) $1/\alpha = 2.3$ Mev, $1/\beta = 1.2\,\hbar$ and $u = 2$ was obtained. The exoits-

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S/056/62/043/005/013/058
B102/B104

AUTHORS: Remayev, V. V., Korda, Yu. S., Klyucharev, A. P., Smirnov, A. M.

TITLE: Decay of some millisecond isomers

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 5(11), 1962, 1649-1652

TEXT: Metallic foils (~10 mg/cm^2) of Ge and Zr, and films of SrO and Nd_2O_3 on organic backings were irradiated with 20-Mev protons from a linear accelerator. The decay mechanism of the resulting isomers was studied in an experimental arrangement as described in ZhETF, 39, 973, 1960. Results: Ge^{71m} was produced in the reactions Ge^{72} (p,pn) Ge^{71m} and Ga^{71}(p,n)Ge^{71m}; in both cases γ-radiation with a peak at E_γ = 170±10 kev ($T_{1/2}$ = 19.5±0.5 msec) was observed, also the conversion-electron peak was indicative of a 170-kev transition (total conversion coefficient α=0.12±0.03) of type M2 or E2; $9/2^+ \xrightarrow{23\text{kev}} 5/2^- \xrightarrow{175\text{kev}} 1/2^-$.

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Decay of some millisecond isomers

Y^{88m} ($T_{1/2}$ = 13.5±0.5 msec) was produced in the reactions $Sr^{88}(p,n)Y^{88m}$ or $Y^{89}(p,pn)Y^{88m}$. Two peaks of almost equal intensity were found: E_γ = 0.23±0.01 ($\alpha \lesssim 0.04$) at transition from the first to the ground level and E_γ = 0.45±0.01 Mev ($\alpha < 0.01$) at transition from the second to the first level. Nb^{90m}, produced in $Zr^{90}(p,n)Nb^{90m}$ (cf. Phys. Rev. 98, 79, 1955) shows a 0.25-Mev transition (from 0.37 (1^+) to 0.12 Mev level) with α = 0.3 ± 0.05 and of type M3. For the Mo^{90} → Nb^{90} decay the scheme $0^+ \xrightarrow{\beta^+} 1^+ \xrightarrow{M3} 4^+ E4 \; 8^+$ is suggested. The halflife of Nb^{90m} (decay from 0.37-Mev level) was obtained as 6.5±0.5 msec. Pm^{141m} ($T_{1/2}$ = 2.2msec), produced in $Nd^{142}(p,2n)Pm^{141m}$, shows an intense peak at ~200 kev and a weak one at 430 kev ($\alpha \gtrsim 0.03$). The latter transition could be of type M1 or E2, but the authors suggest M3. The 200-kev peak most probably consists of two unresolved lines, E_γ = 190±10 kev and E_γ = 220 ± 10 kev (α estimate : 0.4, for each ≈0.2; M1 or E2). The 430-kev transition is not an isomeric one, and the same seems to hold for the both transitions

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AUTHORS: Val'ter, A. K., Academician AS UkrSSR, Klyucharev, A. P., Lutsik, V. A., Orlenko, B. F., Pasechnik, M. V., Academician AS UkrSSR, Prokopenko, V. S., Pucherov, N. N.

TITLE: The elastic scattering of 6.9 Mev protons by chromium and zinc isotopes

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 147, no. 6, 1962, 1325-1327

TEXT: A method described by A. K. Val'ter et al. (ZhETF, 38, 1419 (1960)) was used to investigate the elastic scattering of (6.9 ± 0.07) Mev protons by Cr^{50}, Cr^{54}, Cr^{52}, Cr^{53}, Zn^{64}, Zn^{68}, Zn^{70}. Between 20° and 160°, the angular distribution of the elastically scattered protons was determined in the form of the angular dependence of $\sigma_{exp}/\sigma_{Rutherford}$ every 5°. For chromium the results obtained (Fig. 1) show that the (p,n) reaction definitely makes a partial contribution to the proton scattering by Cr^{52} (reaction threshold 5.63 Mev) and a strong contribution when the protons are scattered by Cr^{53} and Cr^{54} ((p,n) reaction thresholds

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The elastic scattering of ... S/020/62/147/006/012/034
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5.45 Mev). The (p,n) reaction threshold of the zinc isotopes is 8 Mev, but the angular distributions of the proton scattering are similar to those in heavy chromium isotopes. This abnormal angular distribution might be solved by investigating the system Zn^{64} + p in a wide energy range and studying the elastic scattering and possible nuclear reactions. There are 1 figure and 1 table.

ASSOCIATION: Institut fiziki Akademii nauk USSR (Institute of Physics of the Academy of Sciences UkrSSR); Fiziko-tekhnicheskiy institut Akademii nauk USSR (Physicotechnical Institute of the Academy of Sciences UkrSSR)

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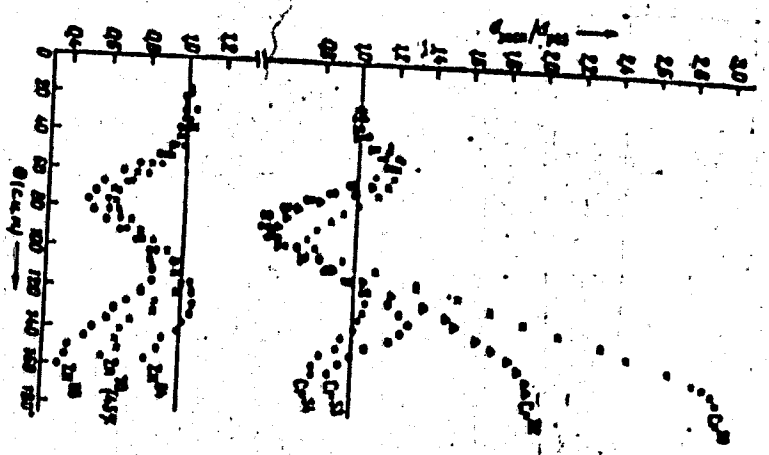

Fig. 1

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