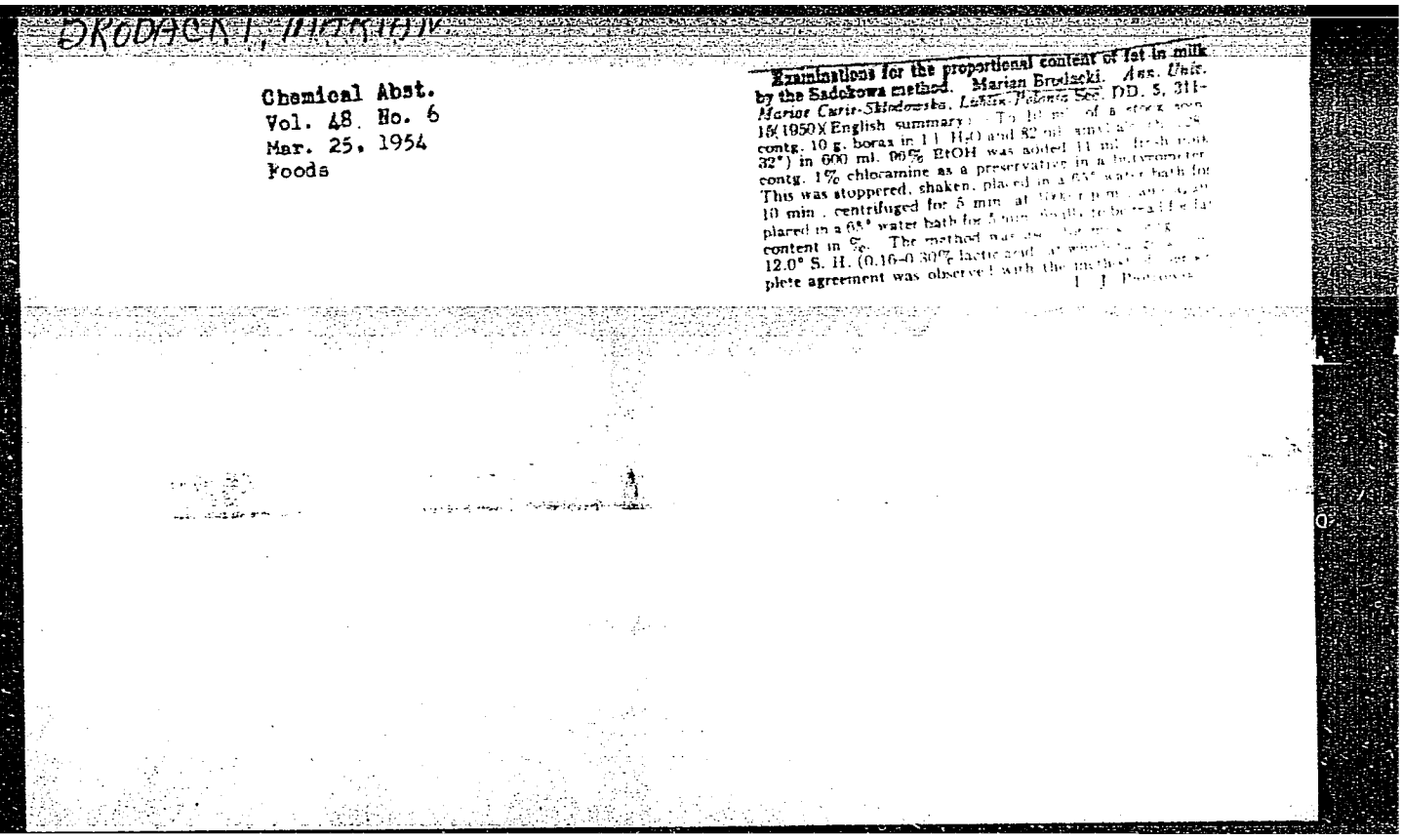

ZRODSKI, MIECZYSŁAW

Chemical Abst.
Vol. 48 No. 6
Mar. 25, 1954
Foods

Examinations for the proportional content of fat in milk by the Sadchowa method. Marian Brolaski. *Ann. Univ. Mariae Curie-Skłodowska, Lublin, Polonia, Sec.* DD, 5, 311-15(1950)(English summary).—To 10 ml. of a stock soln. contg. 10 g. borax in 1 l. H_2O and 82 ml. satd. aq. soln. of $CuSO_4$ (d. 32°) in 600 ml. 96% EtOH was added 11 ml. fresh milk contg. 1% chloramine as a preservative in a butyrometer. This was stoppered, shaken, placed in a 65° water bath for 10 min., centrifuged for 5 min. at [illegible] r.p.m., and again placed in a 65° water bath for 5 min. finally, to be read for fat content in %. The method was [illegible] 12.0° S. H. (0.16-0.30% lactic acid) [illegible] plete agreement was observed with the [illegible]

I. J. Pan[illegible]

P/008/62/000/005/003/003
D265/D308

AUTHOR: Brodacki, Zdzisław, Engineer

TITLE: Aircraft valves

PERIODICAL: Technika lotnicza, no. 5, 1962, 144 - 146

TEXT: Sectional drawings and description are given of the following hydraulic and pneumatic valves: gasolene delivery valve working at 0.5 kg/cm^2 for quick cut-off of fuel delivery; fuel injection pump used for starting where vacuum of 80 mm Hg is produced for sucking in the fuel and then ejecting it into cylinders and air control valve working at 50 kg/cm^2 for controlling the flaps during the flight. There are 9 figures.

Card 1/1

BRODAKIY, V.V.

TRANSMISSION

"Remote Signalization and Remote Control over Radio Relay Lines", by M.V. Brodakiy, V.V. Petrov, G.D. Novspasskiy, and V.F. Zatsepin, Elektrosvyaz', No 8, August 1957, pp 26-31.

Brief presentation of the fundamental principles of the construction of automation, remote-control, and remote-signalization circuits for the presently designed radio R-60 and "Vesna", relay lines with a number of trunks up to 2.5. The operation of the relay remote-control and remote-signalization circuits in the main and intermediate stations is analyzed.

Card 1/1

BRODACKI, Zdzislaw, inz.

Aeronautical valves. Techn lotn 17 no.5:144-145 My '62.

HRODAN, J.

Experiences with the treatment of the perianal haemorrhoidal comples by injections. Cesk. derm. 25 no.7-8:271-273 July 1950. (CIML 20:1)

1. Of the First Dermato-Venereological Clinic in Prague (Head --Prof. K. Gawalowski, M. D.).

BRODAN, VLADIMIR
SURNAME, Given Names

(3)

Country: Czechoslovakia

Academic Degrees: MD

Affiliation: Internal Department of Okres Institute for People's Health (Interni oddeleni OUNZ) Chief Dr. F. KANDERABEK

Source: Prague, Prakticky Lekar, Vol 41, No 15-16, Aug 21, 1961; pp 694-696

Data: "Some Cases of Peroral Poisoning with the Cleaning Fluid Cikuli /Mixture of trichlorethylene and tetrachloroethylene/"

BRODANOVA, Marie
BRODAN, Vladimir

GPO 981643

BRODAN,V.; MAREK,I.; KUHN,E.

A mathematical evaluation of oxygen consumption during physical exercise and recovery. Physiol. Bohemoslov. 14 no.2:201-205 '65.

1. Institute for Human Nutrition and Institute of Mathematics, Charles University, Prague.

BRODAN, V.; Technicka spoluprace CIHOVA, Z.

Determination of lactic acid in the blood serum using a modified Barker-Summerson method. Cesk. gastroent. vyz. 19 no.5:313-318 Jl '65.

1. Ustav pro vyzkum vyzivu lidu v Praze (reditel prof. dr. J. Masek, dr. Sc.).

BRODAN, V.

Physical fitness tests in man. Cesk. gastroent. vyz. 19 no.6: 376-383 S '65.

1. Ustav pro vyzkum vyzivy lidu v Praze (reditel prof. dr. J. Masek, DrSc.).

L 29467-66

ACC NR: AP6019983 SOURCE CODE: CZ/0079/65/007/003/0268/0268

29
B

AUTHOR: Kuhn, E.; Brodan, V.

ORG: Institute of Human Nutrition, Prague

TITLE: Experimental procedures used in studies on psychotropic-drug induced changes in physical fitness /This paper was presented at the 7th Annual Psychopharmacological Meeting, Jesenik, 20-23 January 1965/

SOURCE: Activitas nervosa superior, v. 7, no. 3, 1965, 268

TOPIC TAGS: biologic respiration, central nervous system, nervous system drug, enzyme

ABSTRACT: Indicators of physical exertion are described; their modification by psychotropic drugs is discussed. The drugs can facilitate enzymatic reactions, providing energy to the muscles, decrease fitness by affecting respiration or other body functions, or affect the CNS. /Orig. art. in Eng./ /JPRS/

SUB CODE: 06/ SUBM DATE: none/

Card 1/1

L 29466-66

ACC NR: AP6019985 SOURCE CODE: CZ/0079/65/007/003/0270/0271

AUTHOR: Brodan, V.; Kuhn, E.

ORG: Institute of Human Nutrition, Prague

TITLE: Effect of cycloserine isomers on physical fitness in man [This paper was presented at the 7th Annual Psychopharmacological Meeting, Jesenik, 20-23 January 1965]

SOURCE: Activitas nervosa superior, v. 7, no. 3, 1965, 270-271

TOPIC TAGS: biochemistry, pharmacology, man, biologic metabolism, human physiology

ABSTRACT: Cycloserine (CS) isomers affect physical performance in different ways. d-CS has an excitory effect similar to some narcotic drugs. l and dl increase absolutely and relatively the anaerobic component of energy turnover. The l isomer also increases the level of pyruvic acid. No pharmacodynamic effect on circulation and respiration was found. The CS isomers act mainly on the metabolism. Orig. art. has: 1 table. [Orig. art. in Eng.] [JPRS]

SUB CODE: 06/ SUBM DATE: none/ ORIG REF: 005/ OTH REF: 005

Card 1/1 fv

Physiology

CZECHOSLOVAKIA

KUHN, E.; STRIBRNA, J.; BRODAN, V.; SCHUCK, O.; Institute for Human Nutrition (Ustav pro Vyzkum Vyzivy Lidu) Prague, Director (Reditel) Prof Dr J. MASEK; Research Institute of Experimental Therapy (Vyzkumny Ustav Experimentalni Terapie), Prague, Director (Reditel) Prof Dr O. SMAHEL.

"Renal Response to a Water Load in Subjects on a Low Sodium Diet."

Prague, Casopis Lekaru Ceskych, Vol 105, No 44, 4 Nov 66, p 1209

Abstract: In people with Na depletion water load is eliminated at a slower rate than in normal people. Experiments on 8 men aged 21 to 46 years showed that the maximum minute diuresis is lowered when Na is lowered; the total amount of excreted water also decreases; the concentration index of endogenous creatinine is higher at reduced Na; osmolar clearance of Na and Cl' is reduced; no change in the elimination of NH_4 and K was observed , acid content increased; excretion of water is lowered when excretion of solutes is lowered; Na resorption takes place at an increased ratio of Cl' to Na. 1 Table, 2 Western references.

1/1

CZECHOSLOVAKIA

BRODANOVA, M.; HOENIG, V.; BRODAN, V.; VALEK, J.; KUHN, E.; Laboratory of Pathophysiology of Blood Formation and of Liver Diseases at the 1st Internal Clinic, Faculty of General Medicine, Charles University (Laborator pro Patofyziologii Krvetvorby a Jater pri I. Interni Klinice Fak. Vseob. Lek. KU), Prague, Head (Prednosta) Prof Dr V. HOENIG; Institute of Human Nutrition (Ustav pro Vyzivu Lidu), Prague - Krc, Director (Reditel) Prof Dr J. MASEK.

"Influence of Desferrioxamine B on Blood Sugar Curves."

Prague, Casopis Lekaru Ceskych, Vol 105, No 45, 11 Nov 66, pp 1235 - 1236

Abstract: Peroral glycemic curves after an application of Desferrioxamine B are lower than without the application. After intravenous administration of glucose Desferrioxamine B causes a significant shortening of the time required for disappearance. The resulting plasmatic clearance of glucose is increased. It is not certain whether the fast disappearance is due to glucose absorption by the tissues, or its transformation in the blood. 1 Table, 11 Western, 3 Czech references

BRODANOVA, MARIE

SURNAME, Given Names

(3)

Country: Czechoslovakia

Academic Degrees: MD

Affiliation: Internal Department of Okres Institute for People's Health (Interni oddeleni OUNZ) Chief Dr. F. KANDERABEK

Source: Prague, Prakticky Lekar, Vol 41, No 15-16, Aug 21, 1961; pp 694-696

Data: "Some Cases of Peroral Poisoning with the Cleaning Fluid Cikuli /Mixture of trichlorethylene and tetrachloroethylene/"

BRODANOVA, Marie
BRODAN, Vladimir

GPO 981643

BRODANOVA, M.; HOENIG, V.

Level of plasma iron, copper and total iron binding capacity of the serum in chronic hepatopathies. Cas. lek. cesk. 103 no.33:905-909 14 Ag '64.

1. Laborator pro patofyziologii krvetvorby a jater pri I interni klinice fakulty vseobecneho lekarstvi Karlovy University v Praze, (prednosta prof. dr. V. Hoenig, DrSc.).

BRODANOVA, M.; REJHOLEC, A.; STREJCEK, J.

Level of serum iron and copper and total binding capacity of the serum for iron in relation to the activity of progressive polyarthritis. Cas. lek. cesk. 103 no.45:1242-1246 6 N '64.

1. I interni klinika fakulty vseobecneho lekarstvi Karlovy University v Praze a Vedeckovyzkumna laborator pro patofyziologii krvetvorby a jater pri I. interni klinice v Praze, (prednosta prof. dr. V. Hoenig, DrSc.) a Revmatologicke oddeleni fakultni poliklinicky, Krajzky stav Narodniho zdravi v Praze, (vedouci MUDr. V. Rejholec, CSc.).

BRODANOVA, M.

Genealogical study of hemochromatosis. Acta univ. Carol. [med] (Praha): Suppl. 18: 205-211 '64.

1. I interni linika fakulty vseobecneho lekarstvi University Karlovy v Praze (prednosta: prof. dr. V. Hoenig).

CZECHOSLOVAKIA

BRODANOVA, M.; HOENIG, V.; BRODAN, V.; VALEK, J.; KUHN, E.; Laboratory of Pathophysiology of Blood Formation and of Liver Diseases at the 1st Internal Clinic, Faculty of General Medicine, Charles University (Laborator pro Patofyziologii Krvetvorby a Jater pri I. Interni Klinice Fak. Vseob. Lek. KU), Prague, Head (Prednosta) Prof Dr V. HOENIG; Institute of Human Nutrition (Ustav pro Vyzivu Lidu), Prague - Krc, Director (Reditel) Prof Dr J. MASEK.

"Influence of Desferrioxamine B on Blood Sugar Curves."

Prague, Casopis Lekaru Ceskych, Vol 105, No 45, 11 Nov 66, pp 1235 - 1236

Abstract: Peroral glycemic curves after an application of Desferrioxamine B are lower than without the application. After intravenous administration of glucose Desferrioxamine B causes a significant shortening of the time required for disappearance. The resulting plasmatic clearance of glucose is increased. It is not certain whether the fast disappearance is due to glucose absorption by the tissues, or its transformation in the blood. 1 Table, 11 Western, 3 Czech references.

1/1

BRODAR, S.

"The Otoska cave, a paleolithic station." p. 203
(Razprave Dissertationes Vol. 1, 1951, Ljubljana.)

SO: Monthly List of East European Accessions, Vol. 2, No. 9, Library of Congress, September 1953, Uncl.

BRODAR, S.

"Paleolithic traces in the Postojna cavern." p. 243.
(Razprave Dissertationes Vol. 1, 1951, Ljubljana)

SO: Monthly List of East European Accessions, Vol. 2, No. 9, Library of Congress, September 1953, Uncl.

COUNTRY	:	Yugoslavia	H-25
CATEGORY	:		
ABS. JOUR.	:	RZKhim., No. 5 1960, No.	19642
AUTHOR	:	Briski, B. and Brodarec, A.	
INST.	:	Not Given	
TITLE	:	The Detection of the Presence of Raffinate Peanut Oil in Edible Oils by Paper Chromatography	
ORIG. PUB.	:	Kemija u Industriji, 7, No 1, 1-12 (1958)	
ABSTRACT	:	No abstract.	

CARD: 1/1

BRODAREC, A.; BRISKI, B.

Determination of arachis oil in edible oils by partition chromatography on filter paper. Pt. 2 (Conclusion) p. 93.

KEMIJA U INDUSTRIJI. (Drustvo kemicara-tehnologa NRH) Zagreb, Yugoslavia, Vol. 7, no. 4, Apr. 1958,

Monthly List of East European Accessions (EEAI) LC, Vol. 8, no. 6, June 1959.

Uncl.

BRODAREC, Ivo, dr

Basic health problems and development of public health services.
Lijecn. vjesn. 83 no.7:677-686 '61.

1. Iz Republickog zavoda za zistitu zdravlja u Zagrebu.
(PUBLIC HEALTH)

L 39923-66 EWP(k)/EWP(w)/EWP(v) IJP(c) EM/WW

ACC NR: AT6018300 (A,N) SOURCE CODE: PO/2540/65/013/001/0001/0010 47

AUTHOR: Brodacki, Jo ef -- Brodatski, Ye. B+1

ORG: none

TITLE: Elastic stresses in a thick-walled spherical container at short-term internal pressure

SOURCE: Warsaw, Instytut Mechaniki Precyzyjnej. Prace, v. 13, no. 1(47), 1965, 1-10

TOPIC TAGS: elastic stress, ~~deformation~~, differential equation, ~~spherical container~~ SPHERIC SHELL STRUCTURE, PRESSURE, INTERNAL STRESS, ELASTIC DEFORMATION

ABSTRACT: Analytical formulas have been determined for elastic stresses and deformations in a thick-walled spherical container under a pulsed internal pressure. On the basis of the dynamic equation of internal equilibrium in the container wall and Hooke's law, the differential equation of the radial displacement U(r,t), considered fundamental, was derived. With the given load of the container, appropriate initial

Card 1/2 UDC: 531.252.3:621.64:531.787

ACC NR: AT6018300 O

and boundary conditions were assumed. The entire procedure for solving the equation is given. The analytical formulas have been obtained for stresses and deformations by carrying out operations on the function U(r,t) according to the relationships determined between this function and deformations and stresses. A specific form of the arbitrary function v(r,t), which appears in the formulas, has been proposed. The functions $\varphi(r)$, $\varphi(r)$, and f(r,t), which are necessary for calculating the coefficients, have been determined. The conditions for determining the proper values of parameter ω_n are given. Orig. art. has: 2 figures and 49 formulas. [Based on author's abstract] [NT]

SUB CODE: 20/ SUBM DATE: none/ ORIG REF: 006/ SOV REF: 002/

BRODECKI, A., inz.

Analysis of the activities of the Lodz Branch of the Printers' Section of the Association of Polish Mechanical Engineers and Technicians. Poligrafika 13 no.10:20-22. O '61.

1. Sekretarz Zarządu Sekcji Poligrafor.

BRODECKI, Apolinary

Do the economists of printing have nothing to say about?
Poligrafika 14 no.2:12-13 F '62.

BRODECKI, Apolinary, inz.

Technological reading and its influence upon the level of professional qualifications. Poligrafika 13 no.9:1-2 S '61.

BRODECKI, A., inz.

Plenary session of the Executive Board of the Printers' Section of the Association of Polish Mechanical Engineers and Technicians. Poligrafika 13 no.9:21-23 S '61.

KUBICKI, Roman, inz.; PERSCHKE, Jerzy, inz.; DOBOSZ, Stanislaw, inz.; WECLAWIK, Marian, inz.; MIELNICZUK, Mieczyslaw; BRODECKI, Boleslaw

Two-sided raw material feeding of rotational clinker burning furnaces. Gosp paliw 11 Special issue no.(95):11 Ja '63.

1. Cementownia, Chelm.

BRODECKY, Tadeas (Praha)

Portable equipment for truing packing surfaces of steam boiler manholes. Energetika Cz 13 no.9:503 S '63.

Brodele, N.

Early symptoms of the action of chloronaphthalene on liver function. N. Brodele. *Latvijas PSR Zinātņu Akad. Vēstis* 1953, No. 6, 81–5.—Chronic periodic inhalation of chloronaphthalene (halowax) vapor by rabbits caused liver-function changes within 2 to 4 months. Decrease in the urea level of urine and in blood-sugar level were among the 1st observable symptoms. In later stages, the blood-sugar level again increased. Other changes were increase in the cholesterol and decrease in the ascorbic acid content of blood.

——A. Dravnieks

BRODELE, N.

Sanitary and hygienic conditions in furniture workshops of Riga which use urea-formaldehyde glues. Vestis Latv ak no.1:135-138 '61.

USSR/Pharmacology and Toxicology - Toxicology. V-9

Abs Jour : Ref Zhur - Biol., No 21, 1958, 98622

Author : Brodele, N.

Inst : AS Latvian SSR

Title : Early Signs of the Chloronaphtalene Effect on the Function of the Liver.

Orig Pub : Izv. AN LatvSSR, 1955, No 9, 81-85.

Abstract : It was established in experiments on rabbtis that prolonged inhalation of chloronaphtalene vapors (2-4 months) leads to an effect on liver functions. In blood, the changes of the sugar and urea content are expressed above all. In early stages the amount of sugar in the blood decreases; in later ones it increases. Lowering of urea is observed in early stages. Lowering of sugar and urea in the blood may serve as an early sign of liver function disturbance. -- A.G. Pinus

Card 1/1

BRODELE, N.

Sanitary and hygienic conditions in furniture workshops of Riga using urea-formaldehyde glues. Vestis Latv ak no.1:135-138 '61.
(EEAI 10:9)

(Furniture) (Formaldehyde) (Urea)
(Glue) (Riga)

BRODELIS, Ya. [Brodelis, J.]

Seven-year plan assignment carried out in five years. Prof.-tekh. obr. 20 no.12:4-5 D '63. (MIRA 17:1)

1. Nachal'nik Glavnogo upravleniya professional'no-tekhnicheskogo obrazovaniya pri Sovete Ministrov Latviyskoy SSR.

BRODELIS, Ya. [Brodelis, J.]

Vocational and technical schools of the Latvian S.S.R. in the anniversary year. Prof.-tekh. obr. 22 no.7:6-7 Jl '65.
(MIRA 18:8)

1. Nachal'nik Glavnogo upravleniya professional'no-tekhnicheskogo obrazovaniya pri Sovete Ministrov Latviyskoy SSR.

BRODELIS, Ya.

27-11-5/31

AUTHOR: Brodelis, Ya., Chief of the Administration of Labor Reserves of the Latvian SSR

TITLE: The Schools of Latvia on the Rise (Uchilishcha Latvii na pod"yeme)

PERIODICAL: Professional'no - Tekhnicheskoye Obrazovaniye, 1957, # 11, p 6-7 (USSR)

ABSTRACT: The article is a report of what has been done by the Latvian Schools of the Labor Reserve in connection with the 40th Anniversary of the October Revolution. They pledged to re-equip 16 school rooms, workshops and laboratories, to manufacture the standard equipment for 25 school rooms, to modernize 20 metal-cutting machines and to introduce 28 improvement suggestions. The Technical School # 3 fulfilled its yearly plan by 153.5 %, and the students of Art Trade School # 17 exceeded their year's plan in the manufacture of cupboards, chairs and tables, of 142,000 rubles worth. Trade School # 7 made overcoats, costumes and dresses worth almost 300,000 rubles, exceeding by far the year's quota. The article mentions a number of other schools, including agricultural mechanization

Card 1/2

The Schools of Latvia on the Rise 27-11-5/31

schools and their achievements.

ASSOCIATION: The Latvian Republic Administration of Labor Reserves
(Latviyskoye respublikanskoye upravleniye trudovykh rezervov)

AVAILABLE: Library of Congress

Card 2/2

BRODER, D. L.

(5)

Chemical Abstracts
Vol. 48 No. 5
Mar. 10, 1954
Nuclear Phenomena

Radiation of zinc[65]. A. A. Bashilov, N. M. Anton'eva, D. L. Broder, and B. S. Dzhelepov (A. A. Zhdanov State Univ., Leningrad). *Izvest. Akad. Nauk S.S.S.R., Ser. Fiz.* 17, 468-80(1953).—The upper limit of the β^+-spectrum is 325 ± 2 e.kv. The energy of γ-rays corresponding to the conversion of Zn^{65} with a K-electron to Cu^{65} is 1122 ± 5 e.kv.; $e/\beta^+ = (5.5 \pm 0.5) \times 10^{-3}$ (e = the no. of conversion electrons). The ratio β^+/γ was established with the help of the photoeffect, a piece of Zn wire, activated by slow neutrons and enclosed in Pb foil being used as a photoelectron source; $\beta^+/\gamma = (3.0 \pm 0.2) \times 10^{-3}$. $\alpha_K \leq 0.9\,\alpha_{K+L}$; $\alpha_K] = (1.5 \pm 0.2) \times 10^{-4}$ which corresponds to a $M1$ transition type. The β^+-decay of Zn^{65} leads to the ground state of Cu^{65}. The γ line is emitted when Zn^{65} is transformed into an excited state 1122 e.kv. of Cu^{65}. ft for the transition to the ground state = 3.2×10^7; for the K-electron capture = 2.5×10^7. The ground state of Cu^{65} is $p_{3/2}$, the excited state $-5/2$. Ni^{65} can have transitions to the 1122-e.kv. level of Cu^{65} and to a 2nd higher level, 1490 e.kv. ($f_{7/2}$). Several facts still remain contradictory. S. P.

8-19-54 RMZ

AUTHOR: Broder, D.L. 89-7-14/32

TITLE: On the Reduction of Neutron Currents in Chalybeate Mixtures (Oslableniye potokov neytronov v zhelezovodnykh smesyakh)

PERIODICAL: Atomnaya Energiya, 1957, Vol. 3, Nr 7, p 55 (USSR)

ABSTRACT: The author measured the relaxation length of fast neutrons dependent on the concentration of iron in water. The nuclear reactions $D(d,n)He^3$ (energy of the neutrons $E_o = 4.0 \pm 0.2$ MeV) and $T(d,n)He^4$ (energy of the neutrons $E_o = 14.9 \pm 0.4$ MeV) served as sources for the neutrons. The dimensions of the sources did not exceed 0.7 cm^2. At the reaction $D(d,n)He^3$ the maximum values of the deuteron current amounted to 30 microamperes and at the reaction $T(d,n)He^4$ to 12 microamperes. Furthermore, a Po-Be neutron source in form of a cylinder of 6 mm diameter and 20 mm height was used. The chalybeate mixtures consisted of fittings of 60x60 cm^2 large steel packets in a water mixture. By variation of the thickness of the steel packets at a constant water interspace the concentration of the iron in the water could be varied. This water vessel on its part was surrounded by protective vessels filled with water and paraffin. Impulse-ionization-chambers with a layer of the fission

Card 1/2

material were used as neutron detectors. The thermal neutrons were recorded in a chamber with enriched uranium, and the fast neutrons in a chamber with Th^{232}. The measured dependence of the relaxation length of the neutrons of the above mentioned sources on the concentrations of the iron in water is illustrated by a diagram. The relaxation lengths were computed of the curves of reduction of the currents of fast and slow neutrons for distances of from 10 to 15 free lengths of path. The relaxation length of the fast neutrons decreases at the sources of neutrons with E_o = 14.9 MeV and at the Po-Be source with an increasing concentration of iron in water, but the relaxation length of the thermal neutrons produced by slowing down the fast neutrons has a minimum at a concentration of about 60% of iron (with respect to volume). There is 1 figure.

SUBMITTED: March 7, 1957

AVAILABLE: Library of Congress

Card 2/2

1. Neutron capture-Test results 2. Neutron capture-Equipment 3. Neutron capture-Theory 4. Nuclear reactions-Applications 5. Neutron detectors-Applications 6. Neutron capture-Effects of iron in water

21(4) PHASE I BOOK EXPLOITATION SOV/2583

International Conference on the Peaceful Uses of Atomic Energy. 2nd, Geneva, 1958.

Doklady sovetskikh uchenykh; yadernyye reaktory i yadernaya energetika. (Reports of Soviet Scientists; Nuclear Reactors and Nuclear Power) Moscow, Atomizdat, 1959. 707 p. (Series: Its: Trudy, vol. 2) Errata slip inserted. 8,000 copies printed.

General Eds.: N.A. Dollezhal, Corresponding Member, USSR Academy of Sciences, A.K. Krasin, Doctor of Physical and Mathematical Sciences, A.I. Leypunskiy, Member, Ukrainian SSR Academy of Sciences, I.I. Novikov, Corresponding Member, USSR Academy of Sciences, and V.S. Fursov, Doctor of Physical and Mathematical Sciences; Ed.: A.F. Alyab'yev; Tech. Ed.: Ye. I. Mazel'.

PURPOSE: This book is intended for scientists and engineers engaged in reactor designing, as well as for professors and students of higher technical schools where reactor design is taught.

COVERAGE: This is the second volume of a six-volume collection on the peaceful use of atomic energy. The six volumes contain the reports presented by Soviet scientists at the Second International Conference on Peaceful Uses of Atomic Energy, held from September 1 to 13, 1958 in Geneva. Volume 2 consists of three parts. The first is devoted to atomic power plants under construction in the Soviet Union; the second to experimental and research reactors, the experiments carried out on them, and the work to improve them; and the third, which is predominantly theoretical, to problems of nuclear reactor physics and construction engineering. Yu. I. Koryakin is the science editor of this volume. See SOV/2081 for titles of all volumes of the set. References appear at the end of the articles.

Broder, D.L.

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000306930003-7"

21(8),21(7)

AUTHORS: Broder, D. L., Kutuzov, A. A., Kondrashov, A. P.

SOV/89-6-5-19/33

TITLE: The Dependence of the Removal Cross Sections of H_2O, B_4C, C, Fe, Pb on the Energy of Neutrons (Zavisimost' secheniy vyvedeniya H_2O, B_4C, C, Fe, Pb ot energii neytronov)

PERIODICAL: Atomnaya energiya, 1959, Vol 6, Nr 5, pp 578-581 (USSR)

ABSTRACT: By means of the removal cross section it is comparatively easy to calculate a shield consisting of a mixture of water and various elements. The removal cross sections were measured for 4 and 14.9 Mev neutrons ($D(d,n)He^3$ and $T(d,n)He^4$-reactions), for which purpose not water but boron carbide was used as the principal component. The measuring apparatus consisted of 3 cylindrical tanks (diameter 100 cm, thickness in the direction of the deuteron beam 115 cm). The first was filled with boron carbide (1.1 g/cm^3), which contained the neutron source in a special channel. A second and a third tank were connected with the first. During removal cross section measurement the material to be investigated

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took the place of the third tank. The fission chambers, which contain Th^{232}, are used as neutron detectors in a number of channels provided for this purpose. The channels not in use are enclosed in aluminum shells which are filled with boron carbide. The material to be investigated is filled into boxes (cross section 71.100 cm) of 9 cm thickness. The thickness of the lead plates is, however, 9 and 18 cm respectively. Measuring results:

material	density g/cm^3	removal cross section E_n = 4 Mev	E_n = 14.9 Mev
H_2O	1	0.165±0.008	0.084±0.004
B_4C	1.67	0.083±0.003+)	0.058±0.002+)
Fe	7.83	0.169±0.007	0.137±0.005
Pb	11.3	0.113±0.005	0.097±0.005

+) from removal cross section measurements for boron carbide and graphite, corresponding to the reciprocal relaxation

lengths at such distances, which correspond to 8-15 free lengths of paths of neutrons in B_4C and C. The results obtained are compared with those of 5 other publications (table and diagrams), and satisfactory agreement was found. The method of removal cross sections may be extended also to calculation of fast neutron distribution in materials containing other light elements instead of hydrogen.

Professor A. K. Krasin and Candidate of Physico-mathematical Sciences V. V. Orlov acted as advisers. G. N. Deryagin, N. I. Dudkin, A. P. Klimov, V. G. Liforov, Z. S. Blistanova, A. I. Chusov, and V. S. Tarasenko assisted in experimental work. There are 2 figures, 1 table, and 7 references, 4 of which are Soviet.

SUBMITTED: January 21, 1959

21(7) SOV/89-7-3-17/29

AUTHORS: Androsenko, A. L., Broder, D. L., Lashuk, A. I.

TITLE: Gamma-Rays Accompanying the Inelastic Scattering of Neutrons With Energies of 3 Mev

PERIODICAL: Atomnaya energiya, 1959, Vol 7, Nr 3, pp 268-271 (USSR)

ABSTRACT: By means of a γ-scintillation spectrometer the energies of γ-rays were measured which are produced when 3 Mev neutrons are scattered inelastically on titanium, bromine, strontium, iodine, barium, tungsten, iridium, and bismuth. For the production of the neutrons the reaction $D(d,n)He^3$ was used (the neutrons were accelerated up to 200 kev). The neutron source had an intensity of 10^7 n/sec. The crystal NaJ(Tl) with a diameter and a height of 40 mm was shielded against the γ-radiation of the accelerator, together with the corresponding light pipe and multiplier, by means of a strong lead cone. In order to reduce the influence of the neutrons scattered on the walls of the chamber, the entire measuring apparatus was suspended by nylon threads, so that it hovered freely in the middle of the room. The elements under investigation were produced in form of rings from full material, and the rings themselves were placed over the crystal during measurement. The multiplier was connected with a 128-channel amplitude

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Gamma-Rays Accompanying the Inelastic Scattering of Neutrons With Energies of 3 Mev

analyzer and a ferrite accumulator. The energy resolution of the spectrometer in the case of the γ-rays of Zn^{65} amounted to about 10%. The constancy of the neutron flux was checked by means of a boron counter. The measuring results are recorded partly graphically, and partly by tables, a number of new, hitherto unknown γ-lines being found especially in the case of titanium, strontium, iridium and bismuth. A. K. Krasin showed constant interest in this work and assisted in building up the experimental arrangement. A. N. Serbinov took part in the experiments. The results were discussed with I. I. Bondarenko and V. V. Stavinskiy. There are 4 figures, 1 table, and 4 references.

SUBMITTED: January 6, 1959

21 (8)

AUTHORS: Broder, D. L., Kutuzov, A. A., Levin, V. V., Orlov, V. V. Turusova, A. V.

SOV/89-7-4-1/28

TITLE: The Passage of Fast Neutrons Through Lead and Iron

PERIODICAL: Atomnaya energiya, 1959, Vol 7, Nr 4, pp 313-320 (USSR)

ABSTRACT: The present paper gives the results obtained by measuring the spatial distribution of fast neutrons (originating from monoenergetic neutrons of the energy E_0 = 4 Mev and E_0 = 14.9 Mev) and of neutrons of atomic reactors in iron and lead. First, the experimental arrangements are discussed. The reactor of the Pervaya atomnaya elektrostantsiya (First Atomic Power Plant), an experimental nuclear reactor of the VVR type with ordinary water and enriched uranium, and a neutron generator were used as neutron sources. The spatial distribution of neutrons in iron and lead was measured by means of a neutron generator, a neutron detector, and D- and T-targets. A Th^{232}-fission chamber and threshold indicators ($Al^{27}(n,p)Mg^{27}$, $P^{31}(n,p)Si^{31}$, and $S^{32}(n,p)P^{32}$) were used as detectors. The distribution of thermal and epithermal neutrons was measured

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by means of a U^{235}-fission chamber. The results of these measurements in iron and lead are shown by 4 diagrams. The authors then theoretically investigate an infinite homogeneous medium in which an unbounded, plane isotropic source of monoenergetic neutrons with the energy E_0 is located. Neglecting the moderation of neutrons in elastic scattering, the kinetic equation for the neutron collision density $\psi(\vec{r},E)$ is written down. The inelastic scattering is here assumed to be isotropic. The aforementioned equation is then transformed by means of a Fourier transformation, and is solved by employing the method of spherical harmonics. The calculation is then followed step by step, and the asymptotic solution is explicitly written down. A formula is written down for the neutron flux with the energy E in a medium with point source. The results shown by some diagrams for iron agree well with the experiment. The same also applies to the results for lead. The computation method suggested makes it possible, if the differential cross sections of elastic and inelastic scattering of neutrons are sufficiently well known, to determine the spatial- and energy distribution of neutrons in thick layers of matter having comparatively high nuclear charge numbers (e.g. greater than 56)

with sufficient accuracy. At large distances from the source, the neutron spectrum is enriched with considerably slowed-down neutrons. If the energy distribution is known, the shield may be calculated according to the multigroup theory. The authors thank Professor A. K. Krasin, Candidate of Technical Sciences A. N. Serbinov, and the scientific co-worker V. A. Romanov for their constant interest in the present paper and for their collaboration in the experiment. Besides, the authors thank V. G. Liforov, Z. S. Blistanov, and V. S. Tarasenko for their assistance in the experiments. S. A. Kurkin assisted in working out the calculation method, and M. B. Yegiazarov, V. S. Dikarev, V. G. Madeyev, Ye. N. Korolev, and N. S. Il'inskiy further took part in the experiments. There are 9 figures and 14 references, 4 of which are Soviet.

SUBMITTED: January 21, 1959

21.1310

77216
SOV/89-8-1-10/29

AUTHORS: Broder, D. L., Kondrashov, A. P., Kutuzov, A. A., ~~Lashuk, A. I.~~

TITLE: Effect of Layers Containing Boron on the Yield of Secondary Gamma Radiation. Letter to the Editor.

PERIODICAL: Atomnaya energiya, 1960, Vol 8, Nr 1, pp 49-51 (USSR)

ABSTRACT: Since in most cases the size and shape of the reactor shielding is determined by the amount of hard secondary gamma radiation, the authors investigated the possibility of reducing this amount by capturing in boron carbide the thermal neutrons producing the radiation. Neutrons captured in boron cause soft γ-rays of approximately 0.5 mev, while neutrons captured in other building materials, particularly steel, produce high energy γ-radiation. The geometry of the experiment is given in Fig. 1.

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Effect of Layers Containing Boron on the Yield of Secondary Gamma Radiation. Letter to the Editor

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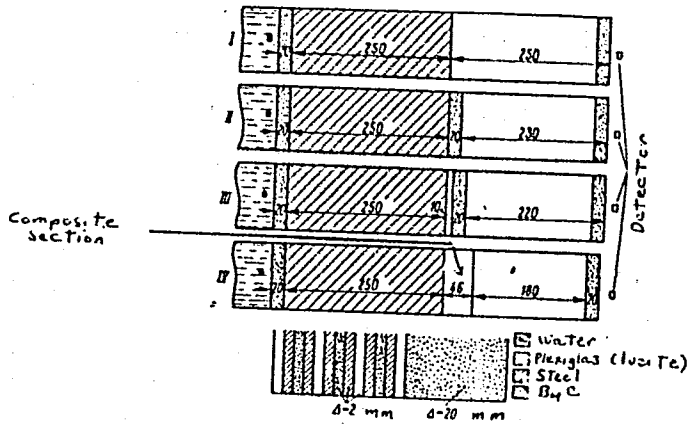

Fig. 1. Geometry of the experiment.

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Effect of Layers Containing Boron on the Yield of Secondary Gamma Radiation. Letter to the Editor

77216
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The cross section of the prism was 710 x 710 mm, and the steels under investigation were St-3 and stainless steel IKh18N9T. The Po- α - Be source of $2 \cdot 10^7$ neutrons/sec strength was located in the water shielding in front of steel. Both the steel and plexiglas (lucite) had channels for indicator probes. Neutron distribution was determined using circular foils of indium 20 mm in diameter, enclosed sometimes in cadium containers. Figure 2 shows the neutron distribution in steel St-3.

Card 3/9

Effect of Layers Containing Boron on the Yield of Secondary Gamma Radiation. Letter to the Editor

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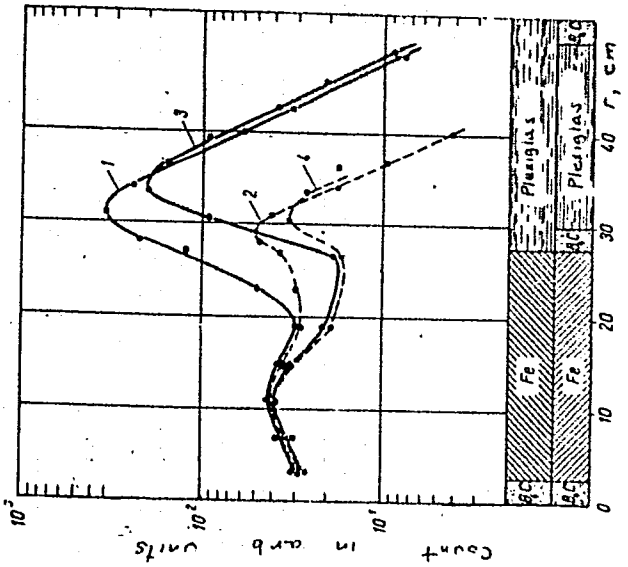

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Fig. 2. See Card 5/9 for Caption

See Card 4/9 for Fig. 2.

Fig. 2. Spacial distribution of neutrons in St-3 steel and plexiglas (lucite) prism: (1) indium measurements (no B_4C layer); (2) measurements with indium in cadmium (no B_4C layer); (3) indium measurements (between steel and plexiglas is placed a layer of B_4C 20 mm thick and of density 1.1 gm/cm^3); (4) measurements with indium in cadmium (between steel and plexiglas is placed a layer of B_4C 20 mm thick and of density 1.1 gm/cm^3).

Spectrum of γ-rays was measured by means of a NaJ(Tl) single-crystal γ-spectrometer. The diameter and height of the crystal were 40 mm. Resolving power for the Zn^{65} line was 11%. The analysis of impulses was performed by means of a 128-channel amplitude analyzer

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with ferrite core memory. Figure 3 and 4 show the measured γ-spectra.

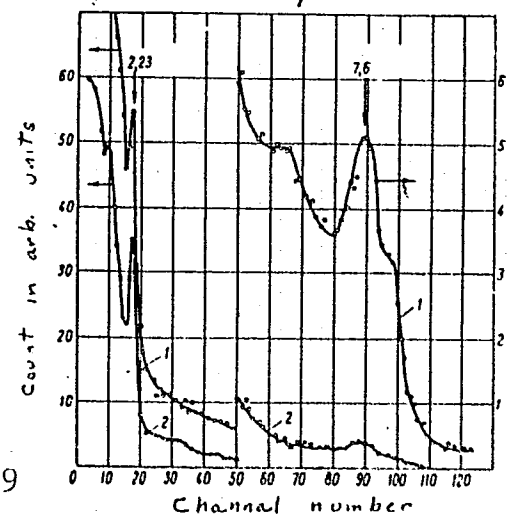

Fig. 3. Spectrum of γ-quanta produced in the St-3 steel prism: (1) No B_4C layer; (2) between steel and plexiglas (lucite) is placed a layer of B_4C, 20 mm thick and density 1.1 gm/cm^3.

Effect of Layers Containing Boron on the Yield of Secondary Gamma Radiation. Letter to the Editor

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SOV/89-8-1-10/29

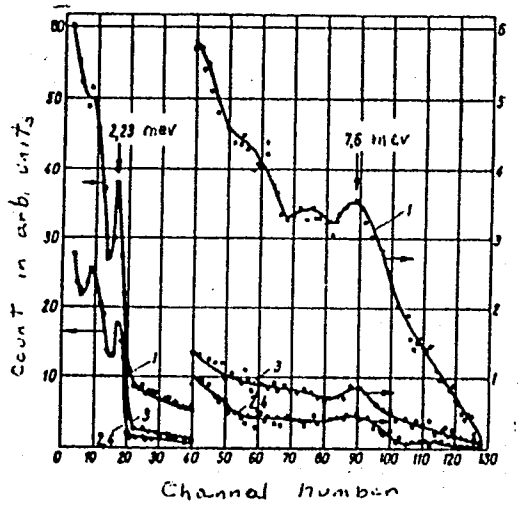

Fig. 4. Spectrum of γ-quanta produced in a prism from stainless steel IKh18N9T: (1) No B_4C layer; (2,4) between steel and plexiglas is placed a layer of B_4C (alternative II, Fig. 1), or a composite section with plexiglas, St-3 and B_4C (alternative IV, Fig. 1); (3) between steel and plexiglas is placed a layer of plexiglas and a layer of B_4C(alternative III, Fig. 1).

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In the case of the St-3 steel, the intensity of the 7.6 mev γ-rays is reduced 13.4 times. In the case of the steel 1Kh18N9T the reduction for the same energy is 7.8 times. This steel contains chromium and nickel, and produces some additional γ-lines. The authors calculated the decrease of the neutron capture of γ-radiations from St-3 after introduction of the boron carbide between the steel and plexiglas, using the measured neutron distribution from Fig. 2. The spectrum of neutrons in steel used in this calculation was determined approximating a half-infinite steel block with an absolutely "black" middle boundary. Corrections were made for the self-shielding of the detectors at the 1.44 ev resonance. The computed decrease of secondary γ-quanta of 9.5 times is in good agreement with the experiment on St-3. N. A. Aleshin, V. S. Borisov, G. V. Rykov, and E. V. Shestopalov were helpful during the work. There are 4 figures; and 2 references, 1 Soviet, 1 U.S. The U.S.

Effect of Layers Containing Boron on the Yield of Secondary Gamma Radiation. Letter to the Editor

77216
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reference is: Reactor Physics Constants, ANL-5800 (1958).

SUBMITTED: August 3, 1959

Card 9/9

85564

S/089/60/009/005/008/020
B006/B070

26.2242

AUTHORS: Androsenko, A. L. (Deceased), Broder, D. L., Lashuk, A. I.

TITLE: Gamma Rays Produced by Inelastic Scattering of 3-Mev Neutrons

PERIODICAL: Atomnaya energiya, 1960, Vol. 9, No. 5, pp. 403 - 406

TEXT: Experiments on the inelastic scattering of 3-Mev neutrons from titanium, chromium, strontium, iodine, barium, tungsten, indium, and bismuth nuclei resulting in the production of gamma rays were described by the authors of this paper in Ref.1. The gamma rays were studied and their energies determined. The present paper gives data of analogous experiments on other scatterers in the form of Tables and Diagrams. The deuterium target of an accelerator was surrounded by blocks of paraffin with admixture of boron carbide. The neutron beam was collimated through an opening 20 mm in diameter in the paraffin lithium-hydride blocks. An NaI(Tl) crystal (40 x 40 mm) and the photomultiplier were arranged in a lead chamber. The samples to be studied were attached to a thin rod

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Gamma Rays Produced by Inelastic Scattering of 3-Mev Neutrons

S/089/60/009/005/008/020
B006/B070

and placed at a distance of 4 cm from the surface of the crystal. The results obtained from a carbon scatterer were used for background correction. There are 4 figures, 1 table, and 8 references: 2 Soviet and 6 US.

SUBMITTED: July 17, 1959

4

Card 2/2

32993
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B108/B102

21.5250
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AUTHORS: Broder, D. L., Kondrashev, A. P., Kutuzov, A. A.

TITLE: Spatial neutron distribution in mixtures of boron carbide with iron and lead

SOURCE: Krupchitskiy, P. A., ed. Neytronnaya fizika; sbornik statey. Moscow, 1961, 263 - 277

TEXT: The results of experiments given in this paper are to verify the possibility of calculating the spatial distribution of fast neutrons in media containing boron carbide. The fast neutrons were obtained from interaction of 1-Mev deuterons with heavy ice (4-Mev neutrons) and of 400-kev deuterons with tritium adsorbed on zirconium (14.9-Mev neutrons). These neutron sources were placed before 9 steel tanks filled with boron carbide and each containing a thin-walled cavity in the middle to place the detector in. The free cavities were filled with boron carbide. In some of the experiments, tank 2 or tank 2 and 3 were replaced by laminated iron or lead blocks. Other experiments provided steel and lead plates between the tanks. Since the tanks were CT-30 (ST-30) steel, all the measurements were made with boron carbide "containing" 3.8% by volume of

Card 1/2

Spatial neutron distribution...

iron. The results showed that iron and lead have similar removal cross sections. Substances with small inelastic scattering cross sections, as boron carbide, have greater removal cross sections in water than in other moderators not containing hydrogen. The ratio of intermediate and slow neutrons ($E_n < 1.5$ Mev) to the fast neutrons was calculated. It was found to be 3.56 for 4-Mev neutrons and 2.58 for 14.9-Mev neutrons. The experimental values were lower and closer to each other. This is due to a lower sensitivity of the U^{235} fission chamber at neutron energies $E > 100$ kev. The authors thank Professor A. K. Krasin, V. V. Orlov, Candidate of Physical and Mathematical Sciences, G. N. Deryagin, N. N. Dudkin, A. P. Klimov, V. G. Liforov, Z. S. Blistanova, A. I. Chusov, V. S. Tarasenko, and R. G. Bulycheva for help. There are 10 figures, 1 table, and 11 references: 4 Soviet and 7 non-Soviet. The four references to English-language publications read as follows: Blizard E. P. Ann. Rev. Nucl. Sci., 5, 73 (1955); Doldstein H. The attenuation of gamma rays and neutrons in reactor shield, NDCA, N. Y., 1957; Burgeois I. et al. Methods and Experimental Coefficients Used in the Computation of Reactor Shielding. A/Conf 15/p/1190 France, 1958; Duggal V., Puri S., J. Appl. I. Phys., 29, 675 (1958).

Card 2/2

S/170/61/004/012/011/011
B104/B138

26.2240

AUTHORS: Broder, D. L., Popkov, K. K.

TITLE: Physical-engineering calculation of a biological shield against the radiation of nuclear reactors

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 4, no. 12, 1961, 118 - 130

TEXT: The problem under consideration requires the calculation of neutron distribution outside the shield. The integral

$$\varphi_M = \int_{V_s} \frac{q_V^E(r_s) f dV_s}{4\pi(r_m - r_s)^2}, \qquad (1)$$

has to be calculated in this connection. $q_V^E(\vec{r}_s)$ is the distribution function of the power density of the source, and $f = f(\delta_s, \delta_t, E)$ is the radiation flux attenuation of energy E in the source and in the shield. The calculation of $q_V^E(r_s)$ is one of the principal stages. Primary radiation (instantaneous neutron fission, instantaneous gamma radiation, gamma

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and neutron absorption) and secondary radiation (capture gamma rays; gamma radiation generated by neutron-activation of the material; neutrons generated by the (γ,n) reaction) should be allowed for when calculating the shield. In the present review, the voluminous international literature is taken as a basis for a thorough examination of the spatial and energy distributions of primary radiation, the power and distribution of sources of secondary radiation, the flux distribution of fast neutrons, the spatial energy distribution of neutrons, and the attenuation of gamma radiation in the shield. There are 1 figure, 4 tables, and 51 references: 25 Soviet and 26 non-Soviet. The four most recent references to English-language publications read as follows: Katcoff S. Nucleonics, 18, 11, 201, 1960; John F. Stehn. Nucleonics, 18, 11, 186, 1960; Troubetzkoy E. and Goldstein H. Nucleonics, 18, 11, 171, 1960; Clark M. D., Nuclear Engineering, 6, 56, jan, 1961.

S/048/61/025/002/016/016
B117/B212

AUTHORS: Broder, D. L., Lashuk, A. I., Sadokhin, I. P.

TITLE: Gamma-radiation yield in inelastic scattering of neutrons on antimony nuclei

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, v. 25, no. 2, 1961, 309-312

TEXT: The present paper was read at the 11th Annual Conference on Nuclear Spectroscopy (Riga, January 25 to February 2, 1961). The authors have investigated the yield of 1.01-Mev gamma quanta which are produced in inelastic scattering of neutrons on antimony nuclei. In these tests annular geometry was used (Fig. 1). 30 mm high rings (3) with an outer diameter of 85 mm and an inner diameter of 60 mm served as scattering specimens. A lead cone (2), height 360 mm, base diameter of 58 mm shielded the crystal against direct radiation. The gamma-radiation spectrum was investigated by means of a scintillation gamma spectrometer with a 40 by 40 mm NaI(Tl) crystal with a relative half-width of the Zn^{65} lines (1.12 Mev) of about 9% (ФЭУ - photomultiplier). The amplitude distribution of the pulses has been studied

Gamma-radiation yield ...

with a 128-channel pulse-height analyzer. The neutrons have been obtained from a $H^3(pn)He^3$ reaction on anelectrostatic generator at a proton energy of 1.5-3.3 Mev. The energy spread of the neutron beam was no wider than 30 kev. Two types of measurements have been made with and without the specimen. The given values are averaged over the two test series. The measurements with 0.9 to 2.5-Mev neutrons have confirmed the gamma lines, as given in Refs. 6-8: 0.49, 0.59, 1.01, 1.32, 1.50, 1.84, 1.96, and 2.16 Mev. A detailed investigation of the spectrum in the region of 1-1.5 Mev is very difficult due to a low intensity of the 1.32-Mev line expected. It is only mentioned that the 1.32 and 1.50 Mev-lines are excited at neutron energies of about 1.5 Mev; this indicates that the Sb^{121} and Sb^{123} nuclei might have 1.50 Mev and even 1.32 Mev levels. A 1.5 Mev cascade transition to the 0.153 Mev level, emitting 1.347 Mev gamma quanta might be possible for Sb^{123}. It has been established that antimony nuclei have an energy level near 1 Mev that is excited by an inelastic neutron scattering. For neutrons with an energy higher than 1.01 Mev, the 0.87 Mev line is visible. At higher energies this line and the 1.01-Mev line become indistinct, which is due to a low resolution of the spectrometer . Another level can be assumed near 900 kev. An other possibility would be a transition from the

1.01-Mev excited state to the 0.153-Mev level and emission of 0.847 Mev-quanta. This is the case if the 1.01-Mev level is referred to Sb^{123} nuclei. The following can be assumed, considering the 1.01-Mev gamma yield for inelastic neutron scattering on antimony nuclei with energies of 1.0-2.5 Mev: For neutron energies between 1.0 and 1.5 Mev the curve corresponds to the excited 1.01-Mev level of antimony nuclei. A cascade transition to this level from the 1.32 Mev-level is not possible, because no gamma line with an energy near 0.3 Mev could be established in the spectra examined. Fig. 4 shows the graph for the gamma yield with an energy of 0.84 Mev for iron nuclei. The data established by the authors of this paper are plotted for 2.0-Mev electrons. The radiation sources which were used to scale the gamma spectrometer are given in the table. There are 4 figures, 1 table, and 8 references: 6 Soviet-bloc.

Legend to Fig. 1: 1) tritium target, 2) lead cone, 3) scattering ring, 4) proton beam

Gamma-radiation yield ...

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B117/B212

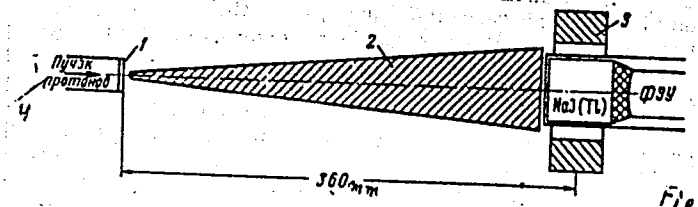
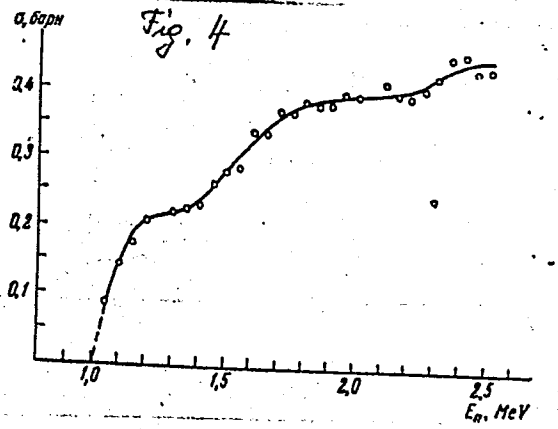


Fig. 1.

Fig. 4



Card 4/4

S/903/62/000/000/016/044
B102/B234

AUTHORS: Broder, D. L., Lashuk, A. I., Sadokhin, I. P.

TITLE: Excitation of the 1.01-Mev level of antimony nuclei in inelastic neutron scattering

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, 187-190

TEXT: Annular targets of Sb and C were bombarded by neutrons from $H^3(p,n)He^3$ reactions; the γ-radiation was recorded by a NaI(Tl) scintillation spectrometer with a 9% energy resolution (for 1.12-Mev quanta of Zn^{65}) whose pulses were fed to a 128-channel pulse-height analyzer. The energy dependence of the γ-quantum yield during inelastic neutron scattering was obtained with the help of a reference curve especially determined for the 0.84-Mev γ-quanta from Fe. The effectiveness of the crystal was taken into account; neutron absorption in the scatterer was neglected. The NaI(Tl) effectiveness was determined with a cascade gamma source. The spectrum of the lines excited in inelastic scattering of 3.0-Mev neutrons contained,

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besides the intense 1.01-Mev line also one at 0.49 and one at 0.59 Mev, corresponding to the 0.506 and 0.573 Mev levels, and furthermore lines at 1.32 and 1.96 Mev. The 1.32 and 1.50 Mev lines indicate the presence of 1.32 and 1.5 Mev levels at Sb^{121} or Sb^{123}. In the case of neutron energies above 1.01 Mev besides the 1.01-Mev line also one at 0.90 Mev is observed, which is due to either a 0.90-Mev level or a transition from the 1.01 to the 0.153-Mev level. The 1.01-Mev level may not be attributed to a definite Sb-isotope. There are 4 figures and 1 table.

ASSOCIATION: Fiziko-energeticheskiy institut Gosudarstvennogo Komiteta Soveta Ministrov SSSR po ispol'zovaniyu atomnoy energii (Physics and Power Engineering Institute of the State Committee of the Council of Ministers of USSR on the Utilization of Atomic Energy)

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4688
S/869/62/000/000/012/012
B102/B186

AUTHORS: Broder, D. L., Leshuk, A. I., Sadokhin, I. P., Suvorov, A. P.

TITLE: Inelastic scattering of neutrons from iron nuclei

SOURCE: Teoriya i metody rascheta yadernykh reaktorov; sbornik statey. Ed. by G. I. Marchuk. Moscow, Gosatomizdat, 1962, 254 - 259

TEXT: The aim of the work was to determine the energy dependence of the inelastic scattering cross section in the range 0.80 - 4.0 Mev by analyzing experimental data as accurately as possible. Supplementary experiments were carried out to provide missing data. The reaction $T^3(p,n)He^3$ was used as a source of neutrons for the 0.80 - 2.5 Mev range, and $D(d,n)He^3$ for 2.5 - 4 Mev. The γ-ray detector was an NaI(Tl) crystal with a ФЭУ-13(FEU-13) photomultiplier. Hence the pulses were fed through an amplifier to a 128-channel pulse-height analyzer. The investigations were carried out for the components of the most abundant natural isotopic composition: 91.68 % Fe^{56}, 5.48 % Fe^{54}, 2.17 % Fe^{57} and 0.31 % Fe^{58}. The cross sections of the γ-quantum yield when neutrons of various energies

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are inelastically scattered were measured. The following values of E_γ were found for E_n = 4.0 Mev: 0.84, 1.02, 1.23, 1.44, 1.81, 2.15, 2.6 Mev. With the exception of 1.41 Mev, all these are associated with scattering from Fe^{56} levels. 1.41 Mev is attributed to scattering from the first Fe^{54} level. The other E_γ are assigned as follows: 1.23 Mev appears when the 2.08 Mev level is excited and then de-excited via the 0.84 Mev level to the ground state. 1.81 Mev is attributed to excitation and cascade de-excitation of the 2.62 Mev level. 2.15 Mev quanta are emitted when the 3.02 Mev level decays via 0.84 Mev to the ground state. The 0.84 Mev quanta are the result of direct transitions from this level to the ground state. In some cases the cross sections obtained differ considerably from the calculated values. There is 1 figure.

Card 2/2

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S/170/62/005/002/004/009
B104/B138

AUTHORS: Broder, D. L., Kutuzov, A. A., Levin, V. V.

TITLE: Shielding properties of water, polyethylene, and Plexiglas

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 5, no. 2, 1962, 47 - 51

TEXT: In an effort to estimate the shielding action of hydrogenous mixtures against fast neutrons, the authors calculated the distribution of fast neutrons in hydrogen and water. The attenuation of a stream of fast neutrons in a hydrogenous mixture with the initial energy E_0 can be calculated from

$$\Phi(r, E_0, E_{rp}) = \frac{Q(E_0)}{4\pi r^2} e^{-\sum_i \rho_i \sigma^i_{rem}(E_0)(1-0)r} \int_{E_{rp}}^{E_0} \varphi(E, E_0, 0r)\, dE, \quad (1),$$

where $Q(E_0)$ is the power of a point source of neutrons, ρ is the volume part of hydrogen nuclei in the shield, and $\varphi(E, E_0, 0r)$ is the spectrum of moderated neutrons. The results are consistent with H. Goldstein's (Fundamental Aspects of Reactor Shielding. Pergamon Press, London-Paris, 1959).

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Shielding properties of ...

The removal cross section for oxygen was obtained from the spatial distribution of neutrons in water and hydrogen. For the purpose of checking the validity of Eq.(1), the distribution of 4-Mev and 14.9-Mev neutrons in polyethylene and Plexiglas was measured. Deuterium and tritium adsorbed on zirconium were used as targets, which were bombarded with 1-Mev and 0.4-Mev deuterons. The experiments showed that a shield against neutrons of 0.2 - 15 Mev, consisting of O, C, Fe, and Pb, can be calculated using the neutron spectrum in hydrogen, the removal cross sections for neutrons as functions of energy, and the analogous cross sections for iron and lead. Z. S. Blistanova, V. P. Bogdanov, G. V. Rykov, and V. S. Tarasenko participated in the work. There are 4 figures and 5 references: 4 Soviet and 1 non-Soviet.

SUBMITTED: April 17, 1961

Card 2/2

43352
S/170/62/005/012/005/008
B104/B186

21.2400

AUTHORS: Broder, D. L., Kumuzov, A. A., Levin, V. V., Frolov, V. V.

TITLE: Using the method of removal cross sections for calculating a shield that contains no hydrogen

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 5, no. 12, 1962, 65 - 70

TEXT: Attenuation of a monoenergetic neutron flux in Al and in mixtures of Al containing equal portions of Pb and Fe was measured; also attenuation in an assembly of Al plates with Fe, Pb, plexiglass or polyethylene blocks placed between source and detector. The neutron sources used were the reactions $D^2(D,n)He$ (E_o = 4 Mev), $T^3(D,n)He^4$ (E_o = 14.91 Mev) and a U^{235} disk exposed to a thermal neutron flux extracted from the reactor of the first atomic power plant in the world. A fission chamber with Th^{232} was used as detector. Results: (1) the removal cross section method can be used to calculate a shield in which light substances are used instead of water; (2) in most cases the removal cross section depends on the moderator only slightly; (3) the removal cross section

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Using the method of removal ...

reaches saturation at relatively small distances from the source; (4) the measurements with a U^{235} fission chamber and those made with a Th^{232} fission chamber are consistent for boron carbide and water. (5) At a sufficiently large distance from the source theirsoiprooal of the relaxation length is equivalent to the removal cross section of any given substance. There are 3 figures and 1 table.

SUBMITTED: July 30, 1962

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AUTHORS: Broder, D. L., Kayurin, Yu. P., Kutuzov, A. A.

TITLE: Passage of gamma radiation through heterogeneous media

PERIODICAL: Atomnaya energiya, v. 12, no. 1, 1962, 30 - 35

TEXT: The buildup factor was measured for heterogeneous media, consisting of different combinations of shielding materials (polyethylene, Al, Fe, Pb). Co^{60} was used as point source (~1 g-equ. Ra, E_0 = 1.25 Mev).

Various combinations of ~10 mm thick plates (Fe and Pb: 700 · 700 mm; polyethylene (P) and Al: 1000 · 1000 mm) were investigated. A plastic scintillator connected via a lightpipe to a ФЭУ-24 (FEU-24) photomultiplier was used as a detector. Dose rates were varied in the range 1 - 10^5 relative units. Measurement accuracy was about ± 10%. The following combinations were investigated: (P) + Pb, (P) + Fe, Fe + Pb, Pb + (P), Fe + (P), Pb + Fe, with the first material nearest to the source. The buildup factor was calculated by the empirical formula

$B_{heter.} = \sum_{n=1}^{N} B_n\left(\sum_{i=1}^{n} \mu_i x_i\right) - \sum_{n=2}^{N} B_n\left(\sum_{i=1}^{n-1} B\mu_i x_i\right)$; B_n is the buildup factor of

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the n-th material, $\mu_i x_i$ is the layer thickness in terms of mean free path. $\mu_{(P)} = 0.061\ cm^{-1}$, $\mu_{Al} = 0.149\ cm^{-1}$, $\mu_{Fe} = 0.425\ cm^{-1}$, $\mu_{Pb} = 0.680\ cm^{-1}$. The buildup factors calculated with this formula agreed with the measured ones within the limits of experimental accuracy. It is recommended for use at energies near 1 Mev. V. A. Shalin and G. V. Rykov are thanked for assistance. There are 7 figures and 7 references: 4 Soviet and 3 non-Soviet. The reference to the English-language publication reads as follows: M. Berger, J. Doggett. J. Res. Nat. Bur. Standards, 56, 89 (1956).

SUBMITTED: April 17, 1961

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000306930003-7"

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S/089/62/012/002/005/013
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26.2240

AUTHORS: ~~Broder, D. L.,~~ Kondrashov, A. P., Kutuzov, A. A., Naumov, V. A., Sergeyev, Yu. A., Turusov, A. V.

TITLE: Multigroup methods of calculating biological shielding

PERIODICAL: Atomnaya energiya, v. 12, no. 2, 1962, 129 - 139

TEXT: The spatial energy distribution for biological shields is calculated for a source at a distance of 40 cm. Seven- and ten-group methods are used and the calculations are made in diffusion-age and diffusion approximations, respectively. As the lower limits of the groups the following energies were chosen for the seven-group method: $1.5\cdot10^6$, $9\cdot10^6$, $4.5\cdot10^5$, $3\cdot10^3$, 3.3, E_{lim} and 0 ev, and for the ten-group method: $4\cdot10^6$, $2.5\cdot10^6$, $1.5\cdot10^6$, $7\cdot10^5$, $3\cdot10^5$, $4\cdot10^4$, $1\cdot10^3$, 6.7, E_{lim} and 0 ev. Spectrum and group constants are calculated for both groups and the results are compared graphically with experimental ones. The experiments were made with the critical assembly of a water moderated

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reactor with a water side reflector. The shield investigated formed the bottom reflector. Three types of shields were investigated, consisting of several layers of various kinds of steel, lead, boron carbide and polyethylene. The neutron flux in the assembly was measured with a copper foil, the thermal-neutron flux in the core with a copper indicator and an U^{235} fission chamber, and, in the experimental assemblies, with a copper indicator in a Cd container. Comparison between theoretical and experimental results permits the following conclusions: 1) Both the multigroup methods, and the group-constants chosen, are suitable for calculating the spatial distribution of neutron energy in shields containing Fe, Pb and H. 2) For shielding systems containing B the agreement with experiment is within 20% error limits. 3) The seven-group method can also be used to determine the spatial distribution of fast neutrons which is characteristic of delayed-neutron flux distribution. For a source emitting 4-Mev neutrons and with large shield thicknesses, the ten-group results differ from the experimental ones by not more than 30%. N. A. Gushchina, L. V. Marchenko, Z. P. Sokolova, Z. S. Blistanova and A. M. Astakhova took part in the calculations, N. A. Aleshin and R.

G. Bulycheva in the experiments. The reactor team members I. G. Morozov, Ye. I. Inyutin, V. K. Labuzov and N. G. Uvarov are thanked for their work. There are 4 figures, 1 table, and 12 references: 7 Soviet and 5 non-Soviet. The reference to the English-language publication reads as follows: D. Hughes, L. Harvey. Neutron cross section, 1958.

SUBMITTED: April 17, 1961

Card 3/3

KARDASHEV, D.A.; STAVINSKIY, V.S.; BRODER, D.L.; LASHUK, A.I.; SADOKHIN, I.P.

Analysis of the excitation functions for levels of the Fe^{56} nucleus in the case of inelastic neutron scattering in an optical nuclear model. Atom.energ. 13 no.6:587-588 D '62. (MIRA 15:12)
(Iron—Isotopes) (Neutrons—Scattering)
(Nuclear optical models)

BRODER, D.L.; KAYURIN, Yu.P.; KUTUZOV, A.A.

Calculating the factors of γ-ray build-up in heterogeneous media. Atom.energ. 13 no.6:593-595 D '62. (MIRA 15:12)
(Gamma rays) (Nuclear reactions)

BRODER, D.L., red.; VESELKIN, A.P., red.; YEGOROV, Yu.A., red.; ORLOV, V.V., red.; TSYPIN, S.G., red.; PODOSHVINA, V.A., red.; NIKITINA, T.K., red.; VLASOVA, N.A., tekhn. red.

[Problems in the physics of reactor shielding] Voprosy fiziki zashchity reaktorov; sbornik statei. Moskva, Gosatomizdat, 1963. 345 p. (MIRA 16:12)
(Nuclear reactors--Shielding (Radiation))

ACCESSION NR: AT4019031 S/0000/63/000/000/0052/0060

AUTHOR: Broder, D. L.; Kutuzov, A. A.; Levin, V. V.; Frolov, V. V.

TITLE: Application of the "removal cross section" method to the computation of non-hydrogen-containing shielding

SOURCE: Voprosy* fiziki zashchity* reaktorov; sbornik statey (Problems in physics of reactor shielding; collection of articles). Moscow, Gosatomizdat, 1963, 52-60

TOPIC TAGS: nuclear reactor, reactor shielding, iron shielding, lead shielding, non-hydrogenous shielding, removal cross section, neutron, neutron spatial distribution, neutron decelerator, aluminum shielding, boron carbide

ABSTRACT: The authors first briefly describe the removal cross section method for the computation of the spatial distribution of neutron streams in hydrogen-containing shielding. Some of the limitations of the method are discussed along with an analysis of the difficulties often encountered in its application (for example, in homogeneous mixtures). The hypothesis has previously been advanced that, by prescinding from the question of the accumulation of low-energy neutrons, the removal cross section technique might be applied to media

ACCESSION NR: AT4019031

containing other light decelerators in place of hydrogen. In these previous investigations, boron carbide in a mixture with iron and lead was studied as the decelerator. Some of the findings of this research are discussed in the present article, which also gives additional experimental data which prove the feasibility of extending and generalizing the removal cross section method to heavier slowing media. Aluminum was employed as the decelerating medium in the tests reported on in this paper. Neutron sources with E = 4 Mev and 14.9 Mev were used. In addition, measurements were made of the removal cross sections of iron and lead in boron carbide in the fission neutron spectrum and the removal cross section of iron in the spectrum of the VVR reactor. As neutron sources the authors used the reactions D (d, n) He^3 with an initial neutron energy of E = 4 Mev, and T (d, n) He^4 (E = 14.9 Mev), and also a disk of U^{235} removed from the reactor of the Pervoy v mire atomnoy elektrostantsii (World's First Atomic Power Station) and placed in a stream of thermal neutrons. The sources were in the form of disks with a diameter of 10 cm for the mono-energetic neutron sources, and 46 mm for the fission spectrum source. Fast neutrons were detected by means of a fission chamber with Th^{232}. Further details on the experimental apparatus are given in the article. Graphs are presented showing the spatial distribution of the fast

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neutrons in different substances and mixtures, as well as the dependence of the removal cross sections of iron and lead in aluminum (and of polyethylene and plexiglass in aluminum) for neutrons with E = 4 Mev and 14.9 Mev on various controlled experimental factors (distance between source and detector, distance between block of removed material and detector, etc). A table is given showing removal cross sections measured in water, boron carbide and aluminum. It is shown that the removal cross section method is applicable to the computation of shielding in which other light media are employed as decelerators in place of water: for example, boron carbide or aluminum. The magnitude of the removal sections for the majority of the substances tested depends only slightly on the choice of the decelerating medium. If a light component is lacking in the shielding, the authors found that the use of the removal cross section method is possible provided the removal cross section of the material in the given medium is known or if the lower boundary of the energy group is substantially raised. Several other significant conclusions are discussed in the article. "The authors thank V. P. Bogdanov, S. G Osipov, G. V. Ry*kov, V. S. Tarasenko and A. I. Chusov for taking part in the measurements."

ACCESSION NR: AT4019031

ASSOCIATION: none

SUBMITTED: 14Aug63	DATE ACQ: 27Feb64	ENCL: 00
SUB CODE: NP	NO REF SOV: 007	OTHER: 003

Card 4/4

ACCESSION NR: AT4019049 S/0000/63/000/000/0198/0207

AUTHOR: Broder, D. L.; Kayurin, Yu. P.; Kutuzov, A. A.

TITLE: The passage of Gamma radiation through heterogeneous media

SOURCE: Voprosy* fiziki zashchity* reaktorov; sbornik statey (Problems in physics of reactor shielding; collection of articles). Moscow, Gosatomizdat, 1963, 198-207

TOPIC TAGS: nuclear reactor, reactor shielding, iron shielding, lead shielding, Gamma radiation, Gamma ray attenuation, Gamma radiation shielding, Gamma radiation accumulation factor, polyethylene shielding, aluminum shielding

ABSTRACT: The authors note that the computation of shielding against gamma-radiation requires a knowledge of one of the essential characteristics of the material — the γ-radiation accumulation factor. For homogeneous media the accumulation factor $B(E_0, x, z, g)$ is a function of the initial energy of the γ-radiation E_0, the thickness of the material x, the ordinal number of the substance z, and also the form of the source g. The significance of the accumulation factor for such homogeneous media is discussed in some detail. Some recommendations, based on general physical considerations, with respect to the computation

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ACCESSION NR: AT4019049

of accumulation factors for heterogeneous shieldings consisting of two materials are analyzed. An experimental determination is made of the dose accumulation factor for heterogeneous media, consisting of various combinations of materials (polyethylene, aluminum, iron, lead), and for γ-quanta energies of 1.25, 2.76 and ca. 6.4 Mev. As the source of the γ-quanta with an energy of 1.25 Mev, Co^{60} was used; for the quanta with the 2.76-Mev energy level, Na^{24} was employed. In order to obtain the high-energy (6.4 Mev) γ-quanta the authors made use of an F^{19} $(p,\alpha)O^{16}$ reaction. On the basis of the experiments with Co^{60} and general physical considerations, an empirical formula was derived for the computation of accumulation factor in a heterogeneous medium consisting of any number of layers of different materials. The experiments with Na^{24} and the 6.4-Mev γ-ray source demonstrated that this formula may be used even in the case of γ-quanta energy levels in excess of the critical. Experimentally derived accumulation factors differ from those computed according to this formula by no more than 15%. Orig. art. has: 3 formulas, 1 table and 9 figures.

ASSOCIATION: none

SUBMITTED: 14Aug63 DATE ACQ: 27Feb64 ENCL: 00

SUB CODE: NP NO REF SOV: 004 OTHER: 004

Card 2/2

ACCESSION NR: AT4019057 S/0000/63/000/000/0234/0242

AUTHOR: Broder, D. L.; Kondrashov, A. P.; Naumov, V. A.; Popkov, K. K.; Turusova, A. V.

TITLE: Heat release in the shield and body of a reactor

SOURCE: Voprosy* fiziki zashchity* reaktorov; sbornik statey (Problems in physics of reactor shielding; collection of articles). Moscow, Gosatomizdat, 1963, 234-242

TOPIC TAGS: nuclear reactor, reactor shielding, heat release, heat emission, reactor heat dissipation

ABSTRACT: A considerable amount of energy is liberated in the active zone of a reactor due to the long-range neutron and γ radiation. This excess of energy is particularly important in the construction of water shielded reactors. Consequently, the following processes must be considered in the calculation of heat release: (1) γ radiation in the active zone of the reactor; (2) γ radiation arising from the capture of neutrons; and (3) α-particles from the B^{10} $(n\alpha)Li^7$ reaction. The γ radiation thus comes from five processes: (a) Flux of γ rays from the active zone:

$$\varphi_\gamma^a = \frac{q_\gamma^a}{2\mu_{a.z}} \sum_{j=1} A_j^{Fe} \left\{ E_2 \left[(1+a_j^{Fe}) \sum \mu_i x_i \right] - E_2 \left[(1+a_j^{Fe}) \left(\sum \mu_i x_i + 1 \right) \right] \right\}, \quad (1)$$

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(b) Flux of γ radiation from neutron capture in the shield and body of the reactor;

$$\varphi^b_{\gamma k}=\frac{q^b_{\gamma k}}{2\mu^{Fe}}\sum_{j=1}^{2}\frac{A_j^{Fe}}{1+\alpha_j^{Fe}}\left\{E_2\left[(1+\alpha_j^{Fe})\sum_i\mu_i x_i\right]-\right.$$
$$\left.-E_2\left[(1+\alpha_j^{Fe})\left(\sum_i\mu_i x_i+\mu_S d\right)\right]\right\}, \qquad (2)$$

$$\varphi^b_{\gamma k}=\varphi^b_{\gamma k}(1)+\varphi^b_{\gamma k}(2)$$

$$\varphi^b_{\gamma k}(1)=\frac{q^b_{\gamma k}(1)}{2\Sigma_1}\sum_{j=1}^{2}A_j^{Fe}\left\{e^{-\Sigma_1\left(d+\frac{\sum\mu_i x_i}{\mu_S}\right)}E_1\left\langle\left[(1+\alpha_j^{Fe})-\frac{\Sigma_1}{\mu_S}\right]\sum_i\mu_i x_i\right\rangle-\right.$$
$$-e^{-\Sigma_1 d}E_1\left[(1+\alpha_j^{Fe})\sum_i\mu_i x_i\right]-e^{-\Sigma_1\left(d+\frac{\sum\mu_i x_i}{\mu_S}\right)}E_1\left\langle\left[(1+\alpha_j^{Fe})-\frac{\Sigma_1}{\mu_S}\right]\times\right.$$
$$\left.\left.\times\left(\mu_S d+\sum_i\mu_i x_i\right)\right\rangle+E_1\left[(1+\alpha_j^{Fe})\mu_S d+\sum_i\mu_i x_i\right]\right\}; \qquad (3a)$$

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$$\varphi^{b}_{\gamma k}(2) = -\frac{q^{b}_{\gamma k}(2)}{2\Sigma_2}\sum_{j=1}^{2} A_j^{Fe}\left\{e^{\Sigma_2\left(d+\frac{\sum_i \mu_i x_i}{\mu_S}\right)}E_1\left\langle\left[(1+\alpha_j^{Fe})+\frac{\Sigma_2}{\mu_S}\right]\sum_i \mu_i x_i\right\rangle -\right.$$

$$-e^{\Sigma_2 d}E_2\left[(1+\alpha_j^{Fe})\sum_i \mu_i x_i\right] - e^{\Sigma_2\left(d+\frac{\sum_i \mu_i x_i}{\mu_S}\right)}E_1\left\langle\left[(1+\alpha_j^{Fe})+\frac{\Sigma_2}{\mu_S}\right]\times\right. \quad (3b)$$

$$\left.\left.\times\left(\mu_S d+\sum_i \mu_i x_i\right)\right\rangle + E_1\left[(1+\alpha_j^{Fe})\left(\mu_S d+\sum_i \mu_i x_i\right)\right]\right\},$$

(c) Flux of γ rays from the radiative capture of neutrons

$$\varphi^{c}_{\gamma} = \frac{q^{c}_{\gamma}}{2\mu_S}\sum_{j=1}^{2}\frac{A_j}{1+\alpha_j}\left\{2 - E_2\left[(1+\alpha_j)\mu_S x\right] - E_2\left[(1+\alpha_j)\mu_S (d-x)\right]\right\}, \quad (4)$$

$$q^{c}_{\gamma}(x) = q^{c}_{\gamma}(1)\,e^{-\Sigma x}; \quad (5)$$

(d) Flux of γ rays due to neutron capture in the water in the space between the shielding;

$$\varphi^{d}_{\gamma k} = \frac{q^{c}_{\gamma} d}{2}\sum_{j=1}^{2} A_j^{Fe} E_1\left[(1+\alpha_j^{Fe})\sum_i \mu_i x_i\right]. \quad (6)$$

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(e) Flux of captured γ radiation in the water in the reactor

$$\varphi_{\gamma}^{c} = -\frac{q_0}{2\Sigma}\sum_{j=1}^{2} A_j^{Fe}\left\{e^{-\Sigma d}E_1\left[(1+\alpha_j^{Fe})\sum_i \mu_i x_i\right] - \right.$$

$$-e^{-\left[\frac{(1+\alpha_j^{Fe})\sum_i \mu_i x_i}{\mu_S}+d\right]\Sigma}E_1\left[(1+\alpha_j^{Fe})\sum_i \mu_i x_i\left(1-\frac{\Sigma}{\mu_S}\right)\right] - \quad (7)$$

$$-E_1\left[(1+\alpha_j^{Fe})\sum_i \mu_i x_i + \mu_S d\right] +$$

$$\left. +e^{-\left[\frac{(1+\alpha_j^{Fe})\sum_i \mu_i x_i}{\mu_S}+d\right]\Sigma}E_1\left\langle\left[(1+\alpha_j^{Fe})\sum_i \mu_i x_i + \mu_S d\right]\left(1-\frac{\Sigma}{\mu_S}\right)\right\rangle\right\}.$$

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ACCESSION NR: AT4019057

The contribution of α-radiation is given by:

$$Q_\alpha(r) = kE_\alpha \sum_{j=1}^{7} n v_j(r) \Sigma_j^\alpha, \quad (8)$$

The experimental determination of the heat release in a reactor was performed by the ionization method, which was found to be more sensitive than the calorimetric method in the case of a zero-power reactor. The energy loss in the solid medium (heat release) is related to the energy loss in the gaseous medium by

$$\frac{(-dE/dx)_{TD}}{(-dE/dx)_{GAS}} = \frac{q}{lvW}, \quad (9)$$

(L. H. Gray, Proc. Roy. Soc. A156, 578 (1936).) The theoretical and experimental results showed satisfactory agreement. Orig. art. has: 3 figures and 17 formulas.

ASSOCIATION: none

SUBMITTED: 14Aug63 DATE ACQ: 27Feb64 ENCL: 00

SUB CODE: NP NO REF SOV: 002 OTHER: 004

Card 5/5

BRODER, D.L.; POPKOV, K.K.

Methods for calculating radiation heat release in the vessel and shields of a nuclear reactor. Atom. energ. 15 no.5:370-377 N '63. (MIRA 16:12)

BRODER, D.L.; ZAYTSEV, L.N.; SYCHEV, B.S.; TUGOLUKOV, A.M.

Effect of the water content of concretes on the thickness and cost of reactor shielding. Atom. energ. 16 no.1:26-32 Ja '64. (MIRA 17:2)

ACCESSION NR: AP4012262 S/0089/64/016/001/0026/0032

AUTHORS: Broder, D.L.; Zaytsev, L.N.; Sy*chev, B.S.; Tugolukov, A.M.

TITLE: Effect of water content in concrete on the thickness of the reactor shield and its cost.

SOURCE: Atomnaya energiya, v.16, no.1, 1964, 26-32

TOPIC TAGS: reactor shield, biological reactor protection, reactor shield cost, reactor shield water concentration, optimal reactor protection

ABSTRACT: The purpose of the present work is to determine the economical aspect of the increasing amount of water in concrete for reactor shieldings. Increasing the water content in concrete increases its hydrogen concentration which effectively reduces the leakage of fast and intermediate neutrons because of the large cross section of hydrogen for fast and intermediate neutrons. Various types of concrete used for reactor shieldings have hydrogen concentration within the 12% range. The authors have computed the biological protection

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