Orlov, Yu. V.

USSR/ Physics - The 0 - 0 transition

Card 1/1 Pub. 22 - 18/47

Authors : Shapiro, M. S., and Orlov, Yu. V.

Title : Intrinsic retarding emmission at the 0 - 0 transition of a nucleus

Periodical : Dok. AN SSSR 101/6, 1047 - 1049, Apr. 21, 1955

Abstract : A calculation is presented of the relative probability of the 0 - 0 transition of a nucleus accompanied by a quantum emmitted by a conversion electron knocked out from the K - shell. Three references: 1 USA and 2 USSR (1940-1953). Diagrams; graph.

Institution : M. V. Lomonosov State University, Moscow

Presented by: Academician D. V. Skobel'tsyn, January 18, 1955

PA - 2029

AUTHOR: ORLOV, YU.V.

TITLE: The Interior Bremsstrahlung in the Case of an Electric Monopole-Like $0^+ \rightarrow 0^+$ -Transition of a Nucleus.

PERIODICAL: Zhurnal Eksperimental'noi i Teoret.Fiziki, 1956, Vol 31, Nr 6, pp 1103-1105 (U.S.S.R.)
Received: 1 / 1957 Reviewed: 3 / 1957

ABSTRACT: The electric monopole-like transition from an excited 0^+ - state to the ground state of the nucleus (which also has the spin zero and positive symmetry) most probably develops to the accompaniment of the production of conversion electrons of electron-positron pairs. On this occasion it is possible that both the conversion electrons and the components of the pair emit γ -quanta with continuous spectrum. The present work brings the result of the relative probability of the interior bremsstrahlung which is emitted by the components of the pair on the occasion of an $0^+ \rightarrow 0^+$ transition of the nucleus. Computation is here carried out in BORN'S approximation and is therefore applicable only to light nuclei.
At first a formula for the differential probability of the interior bremsstrahlung (which is emitted by a pair on the occasion of an electric monopoly transition) is explicitly given. This expression is then integrated over the emission direction of all

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The Interior Bremsstrahlung in the Case of an Electric Monopole-Like $0^+ \rightarrow 0^+$ - Transition of a Nucleus.

particles (the nucleus is assumed to be infinitely heavy) and over the energy of one of the components of the pair. The formula for probability is symmetric with respect to electron and positron. The formula obtained can be applied to the monopoly transitions at present known between the state with the energy 7,68 MeV and the ground state (at C^{12}) as well as between the state with 6,06 MeV and the ground state (at O^{16}). In both cases transition develops mainly together with the emission of electron-positron pairs. BORN'S approximation used here for computation is applicable because C^{12} and O^{16} are light nuclei and the energies of transition are sufficiently high. Next, an expression for the relative probability of the interior bremsstrahlung is given. The numerical integration of this expression permits the determination of the energy spectrum of the γ -quanta and the total relative probability of the process; they are explicitly given for O^{16} and C^{12}. The author further estimated the contribution made towards the continuous spectrum by the γ -rays of that process in which

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The Interior Bremsstrahlung in the Case of an Electric Monopole-Like 0^+ 0^+ - Transition of a Nucleus.

the energy of the transition 0^+ 0^+ is used for the production of a conversion electron and of a quantum. The quantum is in this case emitted by the nucleus itself. As to be expected, the part played by this process is very small, particularly within the domain of low energies of -quanta. Its entire contribution is about 10 times as small as the contribution made by the processes investigated by the present work.

ASSOCIATION: Moscow State University
PRESENTED BY:
SUBMITTED:
AVAILABLE: Library of Congress.

Card 3/3

ORLOV, Yu. V.

"On the Sum Rules for Photonuclear Cross Section,"

Moscow State University.

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

ORLOV, YU V.

89-10-8/36

AUTHORS Belkin, V.F., Krupchitskii, P.A., Orlov, Yu. V.

TITLE Measuring Resonance Absorption of Neutrons in Heterogeneous U/D_2O Systems.

(Ob izmerenii rezonansnogo pogloshcheniya neytronov v geteroregennykh sistemakh v uran - tyazheloy vode).

PERIODICAL Atomnaya Energiya, 1957, Vol. 3, Nr 10, pp. 320-322 (USSR)

ABSTRACT Into a tank filled with D_2O various uranium systems (square lattices with a = 10,0; 6,3 and 3,4 cm; uranium rod diameter 1,75; 1,1 and 0,568 cm) could be fitted. Besides, a uranium converter of ϕ = 3 cm, H = 10 cm was fitted into the center which was irradiated with slow neutrons of the Russian heavy water reactor. Indium foils, packed in cadmium holders, were used as neutron detectors. The coefficients α and A of the relation

$$-\ln \gamma = \gamma = \frac{\alpha}{s_3}\left(Q^{3/2} + AQ^2\right)$$

were determined at $\alpha = 4{,}4\ cm^{1/2}$ and $A = 0{,}40\ cm^{-1/2}$. The expression $\gamma s_3 \rho^{-2/3}$ for the uranium D_2O system is, measured by means of this method, lower than in the case of measuring by other methods.

CARD 1/2

Yu V. Orlov

Distr: 4E3d

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INTERNAL BREMSSTRAHLUNG IN ELECTRIC MONOPOLE $0^+ \rightarrow 0^+$ NUCLEAR TRANSITIONS. Yu. V. Orlov (Moscow State Univ.). Soviet Phys. JETP 4, 944-5(1957) July.

The results of calculations of the relative probability of internal bremsstrahlung emitted by the components of a pair in $0^+ \rightarrow 0^+$ nuclear transition are given. The calculation is done to the Born approximation and is therefore applicable only to light nuclei. (L.T.W.)

RMR 1/1

ORLOV Y. V.

LUKYANOV, A. V., ORDOV, Y. V., TIKHONOV, A. N., TUROVTSEV, V. V. and SHAPIRO, I. S.

"Le Models Optique pour l'interaction avec les noyaux des neutrons d'energie moyenne."

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

LUKYANOV, A. V., ORLOV, Yu. V. and TUROVTSEV, V. V.
Moscow State University, US.S.R.

"Optical Model of the Interaction Between Intermediate Energy Neutrons and Nuclei," Nuclear Physics, v. 8, pp. 325-337, (1958) (North-Holland Publishing Co., Amsterdam)

Abstract: An optical model of the Nucleus is investigated in which a complex potential with a tail expressed by a third degree polynomial is employed. Parameters of the model which give the best fit between the theoretical cross sections σ_t and σ_s the experimental values for 14 MeV neutrons have been determined. The agreement is quite satisfactory for nuclei heavier than the chromium nucleus. The elastic scattering neutron angular distributions computed with aid of these parameters also satisfactorily agree with experiment. A preliminary investigation at lower energies indicated that in a relatively broad range the parameters depend only weakly on the energy.

APPROVED FOR RELEASE: Wednesday, June 21, 2000 CIA-RDP86-00513R001238

SOV/56-35-3-

24(5)
AUTHORS: Luk'yanov, A. V., Orlov, Yu. V., Turovtsev, V. V.

TITLE: Optical Model for the Interaction Between Neutrons of Medium Energy and Nuclei (Opticheskaya model' dlya vzaimodeystviya neytronov srednikh energiy s yadrami)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 3, pp 750-756 (USSR)

ABSTRACT: In their introduction the authors discuss several papers dealing with model representations of the interaction between nucleons and nuclei, which have already been published (Feshbach (Feshbakh), Porter, Weisskopf (Vayskopf), (Ref 1): neutron-nucleus interaction, square well potential; Nemirovskiy (Ref 4): low energy neutrons, optical model; Beyster, Walt (Uolt), Salmi (Selmi) (Ref 5) investigated interactions at various energies up to 14 MeV . In the present paper an optical nuclear model is investigated in which the nucleus is described by a complex potential; this potential has a tail of the shape of a polynomial of the third degree.
$U(r) = V(r) + iW(r) = - U_o(1 + if)f(r)$ with

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Optical Model for the Interaction Between Neutrons of Medium Energy and Nuclei

$$f(r) = \begin{cases} 1 & r \leqslant R-d \\ 1 + (r-R-2d)(r-R+d)^2/4d^3 & R-d \leqslant r \leqslant R+d \\ 0 & r \geqslant R+d \end{cases}$$

(cf. also figure 1). Like in the case of the experimental works (Refs 6-9) 14 MeV neutrons are investigated. In the present case it was possible to select the parameters of the model in such a manner that good agreement was obtained between the theoretically calculated cross sections σ_t, σ_r, σ_s with those found by experiment (in this connection cf. figures 4, 5, $\sigma(A^{1/3})$ diagrams, comparison between the σ-values calculated by the authors and those measured by other research scientists (Ref 6-9)). It was found that agreement is good in the case of nuclei that are heavier than chromium. Also the angular distribution of elastically scattered neutrons, calculated on the basis of the aforementioned parameters, agrees well with measured values (compare figure 6: Diagram, differential cross sections in barn/steradian with respect to scattering angles for Bi, Cd, Ca, and Mg for 14,6 MeV neutrons; calculated curves are compared with experimental data from reference 11). For the

Optical Model for the Interaction Between Neutrons of Medium Energy and Nuclei

range of lower energies the parameters found by the authors were found to be only to a small extent dependent on energy within a comparatively wide interval. In conclusion the authors thank Professor I. S. Shapiro for his interest in the work, and Professor A. N. Tikhonov, who supervised calculations, and G. A. Samoylova for her valuable help in evaluating results. There are 6 figures and 11 references, 2 of which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy institut yadernoy fiziki pri MGU (Scientific Research Institute for Nuclear Physics of Moscow State University)

SUBMITTED: April 11, 1958

Card 3/3

24.6600,24.6820

77015
SOV/56-37-6-55/[illegible]

AUTHOR: Orlov, Yu. V.

TITLE: Letter to the Editor. Theory of the Direct Nuclear Photoeffect

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 6, pp 1834-1836 (USSR)

ABSTRACT: The mechanism of the direct nuclear photo-effect introduced by P. Jensen (cf., Naturwiss., 35, 190, 1948) was qualitatively confirmed experimentally (cf., G. M. Shklyarovskiy, Zhur. eksp. i teoret. fiz., 36, 1492, 1959). However, in these works the interaction of the ejected nucleon with nucleus was either not considered or taken in a simplified form (cf., J. Eichler, H. A. Weidenmuller, Zs. Phys., 152, 261, 1958). Expressions were derived for the cross section of the direct photo-nuclear effect with compensation of spin-orbital coupling. The method was based on the dipole approximation within the frame of the shell model with JJ-coupling. Derivations

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Letter to the Editor. Theory of the Direct Nuclear Photoeffect

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were made in the nonrelativistic approximation in respect to nucleon and were limited to nuclei with completely filled sub-shells. The differential cross section of the direct nuclear photo-effect was expressed by the expression:

$$d\sigma / d\Omega = \sum_{nlj} (d\sigma / d\Omega)_{nlj};$$

$$(d\sigma / d\Omega)_{nlj} = (4e^2K / 3Mc^2k)(2l+1)(2j+1) \sum_{ll'L} (-i)^l i^{l'} (-1)^{l'-l+1} \times$$

$$\times (2L+1)(2L'+1)(2l+1)(2l'+1) C^{l0}_{l0l0} C^{l'0}_{l'0l0} W(l^1/_2 1l; lj) \times$$

$$\times W(l'^1/_2 1l'L'; j) a^{(ll)*}_{nlj} a^{(l'l)}_{nlj} \times$$

$$\times \sum_g [C^{g1}_{11L0} C^{g1}_{11L'0} (1 + \cos^2\theta) - C^{g0}_{10l0} C^{g0}_{10L'0} \sin^2\theta] X(j1l', lgL', lL^1/_2).$$

$$a^{(ll)}_{nlj} = [M(E - I_{nlj}) / h^2] \int_0^\infty \varphi_{lL}(r) R_{nlj}(r) r^3 dr.$$

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Letter to the Editor. Theory of the Direct Nuclear Photoeffect

(here, W is Rock's coefficient; φ_{IL} and R_{njl} are radial portions of the wave function of the final and initial nucleon; E is energy of escaping nucleon; $E_{njl}(>0)$ is coupling energy of nucleon in the subshell (njl); K, k are wave numbers of escaping and γ-quantum, respectively; ε is "effective charge" of nucleon, which is equal to eZ/A for neutron and eN/A for proton; θ is angle between vectors **K** and **k**). A summation was carried out in respect to closed subshells. If the subshell contains one nucleon, then the corresponding cross section must be multiplied by $(2j + 1)^{-1}$; $\hbar ck = E + E_{njl}$. The role of the imaginary part of the potential was estimated by numerical calculations. The obtained values are summarized in the table below:

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Letter to the Editor. Theory of the Direct Nuclear Photoeffect

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The calculations were not corrected for spin-orbital interactions and, therefore, the results are in the rough form: More precise calculations are being prepared by the author and will be published in the near future. This work was performed under the guidance of I. S. Shapiro; L. D. Blokhintsev and E. I. Dolinskiy made contributions in the course of this study. There are 10 references; 1 U.K., 1 Italian, 2 German, 4 U.S., 2 Soviet. The U.S. and U.K. references are: E. D. Courant, Phys. Rev. 82, 703, 1951; S. Sveoka, Can. J. Phys., 37, 232, 1959; L. C. Biedenharn,

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Letter to the Editor. Theory of the Direct Nuclear Photoeffect

77015
SOV/56-37-6-55/55

J. M. Blatt, M. E. Rose. Rev. Mod. Phys., 24, 249, 1952; A. Simon, T. A. Welton, Phys. Rev., 90, 1042, 1953; N. Feather, Adv. Phys., 2, 141, 1953.

ASSOCIATION: Institute Nuclear Physics at the Moscow State Univ., USSR (Institut yadernoy fiziki Moskovskogo gosudarstvennogo universitet, SSSR)

SUBMITTED: July 21, 1959

Card 5/5

37355

S/194/62/000/003/032/036
D256/D301

9.4120

AUTHOR: Orlov, Yu. V.

TITLE: Recovery of control in mercury thyratrons

PERIODICAL: Referativnyy zhurnal, Avtomatika i radioelektronika, no. 3, 1962, abstract 3-3-74a (Izv. Leningr. elektrotekhn. in-ta, 1961, no. 45, 135-146)

TEXT: The control recovery time is often identified with the time of deionization; in fact the recovery of control is caused by the deionization and depends on it. The deionization is followed by a decrease in the concentration of charged particles and a reduction of the grid ion current, and at the same time an increase of the ion shell. Following a closure of the shell the discharge space separates into two regions: Cathode-grid and grid-anode. By using an oscillographic display it was verified that for an anode potential negative and larger than the potential of the grid the anode receives a current of ions and the cathode - electrons, and the ion current of the grid decreases. In a case of a more negative

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D256/D301

Recovery of control ...

grid potential the grid ion current decreases at the instant of shell closure. The time of the shell closure strongly depends on the height of the grid cylinder, by increasing the height of the grid and the grid bias voltage the closure time can be reduced. The increase of the ion shell at the orifice, the closure of the ion shell and the closure time - all are determined by the decrease of the charged particle concentration. At this time the grid is not blocking the tube and the closure of the shell separates the discharge space into two regions: Cathode-grid and grid-anode; only then the grid starts to recover its blocking properties, but the grid is not yet able to block any anode voltage owing to the influx of ions from the residual plasma. Thyratrons with positive ignition characteristics show the shortest control recovery time. From the performed investigations it was possible to estimate various factors influencing the recovery time. Methods of devising mercury thyratrons for increased frequencies are indicated. A description is given of a 5 amp, 3.4 kc/s experimental thyratron. 6 references. [Abstracter's note: Complete translation.]

Card 2/2

LUK'YANOV, A.V.; ORLOV, Yu.V.; TUROVTSEV, V.V.

Optical nuclear model with a polynomial potential. Zhur. eksp. i teor. fiz. 41 no.5:1634-1643 N '61. (MIRA 14:12)

1. Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.

(Nuclear optical models)
(Potential, Theory of)

S/056/62/042/001/037/048
B125/B102

AUTHOR: Orlov, Yu. V.

TITLE: Direct nuclear photoeffect and the optical model of the nucleus

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 1, 1962, 247-252

TEXT: In continuation of an earlier paper (Yu. V. Orlov, ZhETF, 37, 1834, 1959) the author studies the effect of various characteristics of the interaction on the cross section and the polarization of the direct nuclear photoeffect within the shell model with jj-coupling in dipole approximation. The interaction of the departing nucleon and the nucleus was described by the complex potential of the optical model and the initial and final states are described by rectangular potentials. The cross section of the direct nuclear photoeffect is given by

$$d\sigma/d\Omega = \sum_{(n/l)} (d\sigma/d\Omega)_{n/l}, \qquad j = l \pm 1/2;$$

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Direct nuclear photoeffect ...

$$(d\sigma/d\Omega)_{njl} = A_{njl} + B_{njl}\sin^2\theta = \beta e^2 MKk\,[2\hbar^2(2l+1)^2]^{-1}(\bar{A}_{njl} + \bar{B}_{njl}\sin^2\theta);$$

$$\bar{A}_{nl\pm1/2,l} = 2\,[2(l\pm1)+1]^{-2}\,[(2l+1)^2(l\pm1)(l\pm1+1)\langle{}^3/_2,\ {}^3/_2\rangle +$$
$$+ 2\,[2(l+1)(l\pm1)\mp1]\langle{}^1/_2,\ {}^1/_2\rangle - (2l+1)(2l+1\pm3)\langle{}^3/_2,\ {}^1/_2\rangle| + \quad (1)$$
$$+ (2l+1\mp1)\,[2(l+1)+1]^{-1}\,[(2l+1\pm3)(2l+1)\langle{}^3/_2,\ -{}^1/_2\rangle +$$
$$+ 2\langle{}^1/_2,\ -{}^1/_2\rangle| + 2l(l+1)\langle -{}^1/_2,\ -{}^1/_2\rangle,$$
$$\bar{B}_{nl\pm1/2,l} = [2(l\pm1)+1]^{-2}\,[(2l+1)^2(l\pm2)(l\pm2+1)\langle{}^3/_2,\ {}^3/_2\rangle -$$
$$- (2l+3\pm1)(2l-1\pm1)\langle{}^1/_2,\ {}^1/_2\rangle + 3(2l+1)(2l+1\pm3)\langle{}^3/_2,\ {}^1/_2\rangle| -$$

The explicit dependence on l is more convenient for concrete calculations. $\beta = 1$ holds for subshells with one particle, $\beta = 2$ with two particles, with a hole $\beta = 2j$ and for a filled subshell $\beta = 2j+1$. Also relative polarization of the nucleons departing from a given subshell (njl) is described by the simple expression

$$P_{njl} = \sin 2\theta\,(2l+1)\{4\,[2(l\pm1)+1]\,(\bar{A}_{njl} + \bar{B}_{njl}\sin^2\theta)\}^{-1}\{-(2l+1\mp1)\times \quad (2)$$
$$\times\overline{\langle{}^1/_2,\ -{}^1/_2\rangle} + (2l+1\pm3)\,[(2l+1\mp1)\overline{\langle{}^3/_2,\ -{}^1/_2\rangle} \pm\overline{\langle{}^3/_2,\ {}^1/_2\rangle}|\},$$
$$j = l\pm{}^1/_2; \qquad \overline{\langle j_1,\ j_2\rangle} \equiv \mathrm{Im}\,(a^{*}_{l\pm1/2}a_{l\pm1/2}).$$

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Direct nuclear photoeffect ...

which explains the interference type of polarization. Zero follows polarization for the neutrons of the s-shell from

$$P_{nj} = \pm \sin 2\theta (2l + 1) (4 (\bar{A}_{nj} + \bar{B}_{nj} \sin^2 \theta))^{-1} (2l + 1 \mp 1) \times \qquad (3)$$
$$\times \operatorname{Im} (a^*_{L=l+1} a_{L=l-1}),$$

with $j = l \pm 1/2$ when spin-orbital interaction due to the interference of the waves with $L = l + 1$ and $L = l - 1$ is neglected. The radial matrix element which can be analytically expressed for the rectangular potentials V_0 and V_f is not given explicitly because of its extensive form.

The different orders of magnitude of the results obtained for the two variants of the parameters of the complex potential (I. The imaginary part of the potential depends on the neutron energy:

$W = \int U_f = -(AE^2 + BE + C)$ ($A = -0.0085$ Mev^{-1}, $B = 0.631$, $C = -0.185$);

II. The parameters of the second variant are taken from the paper by H. Feshbach et al. (Phys. Rev., 96, 448, 1954) by using the constant $f = -0.15$) is obviously explained by the use of rectangular potentials. The cross section of this reaction can be reduced by taking account of

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Direct nuclear photoeffect ...

the absorption of the neutrons by the nuclear matter. Relative polarization at an arbitrary angle θ is given by

$$P_1(\theta) = P_1(45^\circ)\sin 2\theta(A_1 + (1/2)B_1/(A_1 + B_1 \sin^2\theta) \quad (5).$$

The results obtained by variant II describe the decreasing character of the energy spectrum of the neutrons and the angular distributions at energies from 3 to 7 Mev. If $\int$ is reduced to zero the agreement between experimental and theoretical angular distribution is still satisfactory. Professor I. S. Shapiro and V. V. Balashov are thanked for the discussion of some results of the present paper. M. Ogareva is thanked for programming and calculating the wave function. I. I. Levintov (ZhETF, 30, 937, 1956) is mentioned. There are 7 figures, 1 table, and 14 references: 2 Soviet and 12 non-Soviet. The four most recent references to English-language publications read as follows: Yu. V. Orlov. ZhETF, 37, 1384, 1959; S. Sueoka. Canad. J. Phys., 37, 232, 1959; N. C. Francis, D. T. Goldman, E. Guth. Phys. Rev., 120, 2175, 1960; V. Emma, C. Milone, A. Rubino. Phys. Rev., 118, 1297, 1960.

ASSOCIATION: Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (Institute of Nuclear Physics of the Moscow State University)

Card 4/5

Direct nuclear photoeffect ...

S/056/62/042/001/037/048
B125/B102

SUBMITTED: August 4, 1961

Card 5/5

44232

S/056/62/043/006/030/067
B125/B102

24.6600

AUTHORS: Kaminskiy, V. A., Orlov, Yu. B.V.

TITLE: Interactions in the initial and final state of direct nuclear reactions

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 6 (12), 1962, 2146-2149

TEXT: A strict consideration of interactions in direct nuclear reactions by applying the dispersion theory of I. S. Shapiro (ZhETF, 41, 1616, 1961; Nucl. Phys., 28, 244, 1961) is reported. For this type of reaction $E_0 = 0$ is valid since there is no anomalous threshold with respect to the energy variable. The singular integral equation

$$M(E) = M_0(E) + \frac{1}{\pi}\int_{E_0}^{\infty} \frac{M(E')h^*(E')}{E' - E - i\eta}\,dE', \qquad (1)$$

for a direct nuclear reaction of the type A + x → B + y has the following particular solution

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Interactions in the initial ...

$$M(E) = M_0(E) + \frac{\rho^+(E)}{\pi} \int_0^\infty \frac{M_0(E')\,h^*(E')}{\rho^-(E')(E' - E - i\eta)}\,dE',$$

$$\rho^\pm(E) = \rho(E)\exp\{\pm i\delta^*(E)\}, \qquad (2),$$

$$\rho(E) = \exp\left\{\frac{E - E_0}{\pi} P \int_0^\infty \frac{\delta^*(E')}{(E' - E_0)(E' - E)}\,dE'\right\}.$$

This solution (which is the only one that vanishes for $M_0 \to 0$) agrees with the iteration series and at $h \to 0$ it goes over to $M_0(E)$. The lengthy calculations necessary for (2) are simplified by the effective interaction radius approximation $\tan\delta^*(E) = \sqrt{E}\,Q(E)/P(E)$ (3) which reduces the problem to determining only one quadrature. $Q(E)$ and $P(E)$ are arbitrary polynomials. The first iteration

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S/056/62/043/006/030/067
B125/B102

Interactions in the initial ...

$$M_1(E) = M_0(E)\, e^{-i\delta^*(E)} \left[\cos\delta^*(E) + 2i \sin\delta^*(E)\right] + \\ + \frac{1}{\pi} P \int_0^\infty \frac{M_0(E')\, e^{-i\delta^*(E')} \sin\delta^*(E')}{E' - E}\, dE'. \qquad (6)$$

differs strongly from the exact solution at the limit $P(E) \to 0$ ($\delta \to \pi/2$) of model (3). For the limit $Q(E) \to 0 (\delta \to 0)$ of these two solutions

$$M(E) = e^{i\delta^*(E)} \left[M_0(E) \cos\delta^*(E) + \frac{1}{\pi} P \int_0^\infty \frac{\rho_1(E)}{\rho(E')} \frac{M_0(E') \sin\delta^*(E')}{E' - E}\, dE' \right], \qquad (5)$$

and (6) agree in first approximation with respect to $\sin\delta^*$ at $\tan\delta^* \sim \sin\delta^* \ll 1$. Therefore, $\sin\delta^* \ll 1$ (i.e. $h^*(E) \ll 1$) represents a sufficient condition for the applicability of (6). These considerations

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support the successful description of direct nuclear interactions by the method of distorted waves. The results are valid for $l \geq l_o$ but do not agree with the experiment at $l < l_o$ and in some cases even at $l = l_o - 1$. l denotes the orbital momentum and $l_o \sim kR$. The dispersion method here discussed bypasses the difficulties of the distorted wave method and should be applied to concrete nuclear interactions. There are 2 figures.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University)

SUBMITTED: June 8, 1962

ACCESSION NR: AT4019050 S/0000/63/000/000/0207/0210

AUTHOR: Avayev, V. N.; Yegorov, Yu. A.; Yemel'yanov, I. Ya.; Zhirnov, A. D.; Orlov, Yu. V.; Remizov, V. A.

TITLE: The Gamma-spectrum of a research reactor

SOURCE: Voprosy* fiziki zashchity* reaktorov; sbornik statey (Problems in physics of reactor shielding; collection of articles). Moscow, Gosatomizdat, 1963, 207-210

TOPIC TAGS: reactor, reactor shielding, reactor Gamma spectrum, Gamma spectrum

ABSTRACT: By means of a scintillation vapro spectrometer, the γ-spectrum of a water-water, pool-type research reactor was measured. The gamma quanta were directed from the active section of the reactor to the spectrometer through a lateral experimental channel, 100 mm in diameter and 2.5 m in length. To exclude the influence of gamma quanta scattered in the channel, a lead collimator, 180 mm in length with a collimation aperture diameter of 10 mm, was inserted in the channel. The spectrometer sensor was placed behind the concrete shielding of the reactor, and the gamma quanta flow passed through a 260-mm long collimator of paraffin with boron and lead carbide. Since the spectrometer was neutron-sensitive, even if only to a negligible degree, tests were conducted under identical conditions with a 100-mm thick bismuth filter and the introduction

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ACCESSION NR: AT4019050

of the proper corrective factor. The results of the experiment are discussed and analyzed. The reactor spectrum was measured to approximately 7.8 Mev. No gamma lines with greater energy were detected, the explanation for this being that in the high energy region the γ-radiation is basically caused by the absorption of neutrons by iron, nickel and chromium. These elements are not present in the active part of the reactor, while the γ-radiation yield from the tube of the gate valve is small and only a negligible part of the trapped gamma quanta is able to reach the spectrometer sensor from the tube. Orig. art. has: 2 figures and 2 tables.

ASSOCIATION: None

SUBMITTED: 14Aug63 DATE ACQ: 27Feb64 ENCL: 01

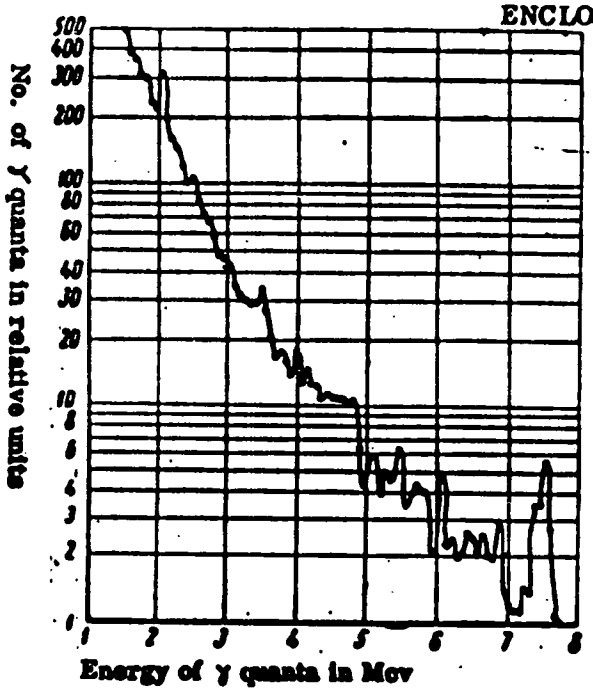
SUB CODE: NS NO REF SOV: 005 OTHER: 001

Card 2/3

ACCESSION NR: AT4019050

ENCLOSURE: 01

Fig. 1 - Gamma-spectrum of the reactor.



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L 11336-63 EPR/EWP(j)/EWT(d)/EPF(c)/EPF(n)-2/EWT(m)/FCC(w)/BDS AFFTC/
ASD/IJP(C)/SSD Pr-4/Ps-4/Pc-4/Pu-4 RM/WW

ACCESSION NR: AP3004886 S/0120/63/000/004/0039/0045

AUTHOR: Avayev, V. N.; Yegorov, Yu. A.; Orlov, Yu. V.; Frolov, A. S.; Chentsov, N. N.

TITLE: Fast-neutron spectrometer with borane scintillator

SOURCE: Pribory*i tekhnika eksperimenta, no. 4, 1963, 39-45

TOPIC TAGS: spectrometer, fast-neutron spectrometer, borane scintillator, scintillator

ABSTRACT: Fundamental characteristics of the fast-neutron spectrometer with one primary detector were calculated on a computer by the Monte-Carlo method. Detailed calculating procedure is illustrated by a chart. "Pseudo-random numbers of the type suggested by N. M. Korobov were used in the calculations." The accuracy of the calculations is held to be 15% or better. Made for three scintillators, the calculations permitted determining efficiency, proper energy

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L 17336-63

ACCESSION NR: AP3004886

Resolution, etc. Analysis of the results permits selecting the optimum delay time in the control channel, resolution time of the coincidence circuit, permissible loading of the spectrometer, and its block scheme. A comparison of several versions of the spectrometer showed that the best composition is a mixture of equal amounts of xylol (or phenylcyclohexane) and trimethylborate with B^{10} enriched to 80%. The resolution time of the coincidence circuit must be 1.5 microsec. Orig. art. has: 7 figures, 6 formulas, and 2 tables.

ASSOCIATION: none

SUBMITTED: 31Aug62 DATE ACQ: 28Aug63 ENCL: 00

SUB CODE: NS NO REF SOV: 005 OTHER: 007

Card 2/2

EWP(j)/EPF(c)/EPF(n)-2/EWT(m)/BDS AFFTC/ASD/SSD Pc-4/
Pr-4/Pu-4 RM/WW/DM

L 12860-63
ACCESSION NR: AP3003970 S/0089/63/015/001/0017/0020

78

AUTHOR: Avaev, V. N.; Vasil'yev, G. A.; Veselkin, A. P.; Yegorov, Yu. A.; Orlov, Yu. V.; Pankrat'yev, Yu. V.

TITLE: Reactor neutron flux attenuation in polyethylene

SOURCE: Atomnaya energiya, v. 15, no. 1, 1963, 17-20

TOPIC TAGS: neutron attenuation, polyethylene, polyethylene neutron attenuation, slow neutron, fast neutron, neutron relaxation length, biological shielding, water-water reactor

ABSTRACT: The attenuation of fast and slow neutron fluxes by polyethylene has been investigated experimentally in a water-water research reactor. A polyethylene 680 x 680 x 1000-mm prism consisting of square plates 10 and 20 mm thick was irradiated by placement in a recess in the heavy concrete shielding of the reactor. The slow neutron fluxes were measured by the use of resonant indicators (indium, iodine) and a BF_3 counter. The fast neutron distribution was measured by means of threshold indicators P(n,p), Al(n,p), and Al(n,α) and a scintillation counter with ZnS(Ag). During measurements the plane indicators were inserted into gaps between the polyethylene plates, and

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L 12860-63

ACCESSION NR: AP3003970

the cylindrical indicators were placed into 20 x 20 x 100-mm holes cut in the plates. The results obtained are shown in Figs. 1 and 2 of the Enclosure, along with theoretical data obtained by the method of moments for a point neutron source. A comparison of neutron relaxation length in polyethylene (density, 0.92 g/cm^3) and in water under identical conditions showed that the relaxation length in polyethylene is 12—17% shorter than that in water. "The authors thank the reactor operating personnel and laboratory technicians who took part in the experiment." Orig. art. has: 2 figures and 4 tables.

ASSOCIATION: none

SUBMITTED: 25Aug63 DATE ACQ: 08Aug63 ENCL: 01

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

Card 2/2

L 11129-63 EWP(j)/EPF(n)-2/EWT(m)/BDS AFFTC/ASD/AFWL/SSD

Pc-4/Pu-4 RM/DM

ACCESSION NR: AP3003971 S/0089/63/015/001/0020/0022 72

AUTHOR: Avayev, V. N.; Vasil'yev, G. A.; Veselkin, A. P.; Yegorov, Yu. A.; Orlov, Yu. V.; Pankrat'yev, Yu. V.

TITLE: Spectra of reactor fast neutrons passed through polyethylene 19 16 15

SOURCE: Atomnaya energiya, v. 15, no. 1, 1963, 20-22

TOPIC TAGS: fast neutron spectra, polyethylene, reactor shielding

ABSTRACT: Measurements were made of the spectra of fast neutrons after passage through a layer of polyethylene plates (680 x 680 x 10 mm) installed in a recess of the shielding of a water-water reactor. The thickness of the polyethylene layer was increased on the side facing of the spectrometer detectors. The measurements were made by means of a fast-neutron spectrometer with a single detector in which γ-background discrimination was achieved by means of a space charge between the last dynode and anode of the photomultiplier. The fast-neutron spectra were determined from the amplitude distribution of pulses produced by recoil protons in the stilbene crystal of the detector. The spectra were corrected for the effect of secondary neutron scattering in the crystal and for partial leakage of recoil protons from the crystal. The results obtained

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L 11129-63

ACCESSION NR: AP3003971

are shown in Fig. 1 of the Enclosure along with the results calculated by the method of moments (shown by the solid line). The measured spectra were found to be in good agreement with theoretical results for all thicknesses of the polyethylene layer at E_n > 3Mev. At E_n < 3Mev a divergence between the experimental and calculated results was noted. However, the tendency for a change in spectra with an increase in layer thickness in this energy range was the same for both calculated and experimental spectra. At neutron energies from 3 to 4 Mev and polyethylene thicknesses greater than 20 g/cm^2, the curve of the measured spectra showed a sharper dip than that of the calculated spectra. This is probably due to some inaccuracy in selecting or averaging the cross sections during calculation. The sharper dip in the curve was also noted in neutron spectra measured in water. "The authors thank their coworkers who serviced the reactor and laboratory assistants who assisted in the carrying out of experiments." Orig. art. has: 1 figure.

ASSOCIATION: none

SUBMITTED: 23Aug62 DATE ACQ: 08Aug63 ENCL: 01

SUB CODE: NS NO REF SOV: 003 OTHER: 002

Card 2/2

L 13561-63 EWT(m)/BDS AFFTC/ASD

ACCESSION NR: AP3003143 S/0056/63/044/006/2090/2099

AUTHOR: Kaminskiy, V. A.; Orlov, Yu. V.

TITLE: Direct nuclear reactions and interaction in initial and final states

SOURCE: Zhurnal eksper. i teor. fiziki, v. 44, no. 6, 1963, 2090-2099

TOPIC TAGS: direct nuclear reaction, initial state, final state, partial-reaction-amplitude, near-threshold behavior, compound nucleus resonance

ABSTRACT: A formal scheme is developed for taking into account the interaction in the initial and final states in direct nuclear reactions. Use is made of the unitarity of the S matrix and of the analytic properties of the reaction amplitude as a function of the energy. The solution of the singular integral equation for the partial reaction amplitude is found. It is shown that the presence of an essential singularity of the type e sup -ikR connected with the size of the nucleus, does not alter the result. The solution of the problem is presented in the form of a product of two factors, one of which contains all the singularities connected with the interaction in the initial and final states, while the singularities of the other are determined by the mechanism of the reaction. The function containing the singularities connected with the interaction is calculated for a

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ACCESSION NR: AP3003143

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rectangular well. The problem of the bound states of the system is considered. The solution for the partial reaction amplitude satisfies physical requirements that determine a unique solution, and has the correct behavior near threshold. The solution also takes into account compound-nucleus resonance effects in direct nuclear reactions. A boundary value problem which is equivalent to but more lucid than the dispersion method is proposed. "In conclusion we use this opportunity to express our sincere gratitude to Prof. I. S. Shapiro for his interest in this work and useful comments, and also to L. D. Blokhintsev and E. I. Dolinskiy for a discussion of the results." Orig. art. has: 41 formulas.

ASSOCIATION: Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (Institute of Nuclear Physics, Moscow State University)

SUBMITTED: 19Jan63 DATE ACQ: 23Jul63 ENCL: 00

SUB CODE: 00 NO REF SOV: 006 OTHER: 007

Card 2/2

VESELKIN, A.P.; YEGOROV, Yu.A.; ORLOV, Yu.V.; PANKRAT'YEV, Yu.V.

Spectra of fast neutrons from a reactor after passing through graphite, lead, and iron. Atom. energ. 16 no.1:32-40 Ja '64. (MIRA 17:2)

ACCESSION NR: AT4019064 S/0000/63/000/000/0289/0303

AUTHOR: Avayev, V. N., Yegorov, Yu. A., Orlov, Yu. V., Frolov, A. S., Chentsov, N.N.

TITLE: Computation and analysis of the characteristics of a spectrometer with a boron-hydrogen scintillator

SOURCE: Voprosy* fiziki zashchity* reaktorov; sbornik statey (Problems in physics of reactor shielding; collection of articles). Moscow, Gosatomizdat, 1963, 289-303

TOPIC TAGS: nuclear reactor, reactor shielding, spectrometer efficiency, xylene borate scintillator, phenylcyclohexane borate scintillator, radiation dosimetry, scintillation spectrometer, boron hydrogen scintillator, neutron energy, yield nucleus method, twin sensor spectrometer, neutron spectrometer

ABSTRACT: Among the methods for determining the energy of fast neutrons, the authors call particular attention to the yield nucleus method, noting that a special position in this method is occupied by scintillation spectrometers. Twin-sensor fast-neutron spectrometers are described and their operational principles are briefly analyzed. It is pointed out that fast-neutron spectrometers with two sensors can operate only with collimation of the neutron stream. The limitations imposed by this circumstance, particularly with reference to the study of fast-neutron spectra behind shielding, are noted. The subject of spectrometers

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ACCESSION NR: AT4019064

with one hydrogen-containing sensor is introduced. The discrimination of the gamma-background in these spectrometers is accomplished through the difference in the glow time of the scintillator when excited by protons and electrons. It is further noted that spectrometers with a single hydrogen-containing sensor are capable of operating without a collimation device. The lower boundary of the measured neutron energy levels is normally not less than 0.7 Mev. While such instruments have been used for a wide variety of test purposes, the author observes that spectrometers with a hydrogen-containing sensor cannot be used for measurements against a high gamma-background. The single-sensor scintillation spectrometer, the scintillator of which contains hydrogen and boron, and which was proposed by Marshall (Bull. Amer. Phys. Soc., 27, 11 (1952)), is described in detail and its advantages are analyzed. It is noted, however, that the data necessary to permit the actual construction of such a spectrometer are lacking in the available technical literature. The following values in particular, are unknown: 1) the efficiency of the spectrometer as a function of the energy of the neutrons; 2) the efficiency as a function of the volume of the scintillator and the ratio of the hydrogen and boron concentrations in it; 3) the time distribution of the pulses from the alpha-particles (with the time read from the moment of the first scattering of the neutron); 4) the energy resolution of the spectrometer as a function of the energy of the neutrons. Noting that attempts have been made to supply this lacking information manually by means of the Monte Carlo method, the results of which have made it

ACCESSION NR: AT4019064

possible to draw certain useful conclusions leading to an initiation of work on the design of a spectrometer, the author calls attention to the failure of the manual method of calculation to provide a complete picture of the required characteristics and the great amount of time such computation techniques necessarily consume. The present article, therefore, reports detailed computations of the characteristics of a boron-hydrogen scintillation-type spectrometer, conducted with the aid of an electronic computer. In individual sections of the paper the author discusses the formulation of the problem, the actual computation of the spectrometer characteristics, the fundamental block-diagram of the program used to carry out the spectrometer characteristic computation described in the article and, finally, an analysis of the results of the computation, on the basis of which all the laws characteristic of a spectrometer with a boron-hydrogen scintillator are explained. The author learned, among other things, that: 1) Spectrometer efficiency as a function of the resolving time of the coincidence circuit has a maximum value, the position of which (on the various graphs and curves plotted in the article) is different for scintillators of different dimensions and composition; 2) Spectrometer efficiency is directly proportional to the concentration of boron nuclei: 3) The efficiency maximum is more distinctly expressed for scintillators with a higher concentration of boron nuclei; 4) The efficiency maximum is less clearly expressed for large volume scintillators: 5) The efficiency maximum is less clearly expressed for a cylindrical scintillator than for a spherical one with identical diameters of the sphere and

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ACCESSION NR: AT4019064

cylinder base, and is shifted in the direction of greater coincidence circuit resolving time. The results of the computation and analysis of the characteristics of a scintillation spectrometer with a boron-hydrogen scintillator showed that, of all the compositions considered, the most suitable is a mixture of equal parts of xylene (dimethylbenzene) or phenylcyclohexane with trimethyl borate with boron B^{10} enriched to 80%, poured into a vessel 80 mm in both diameter and height. The resolving time of the coincidence circuit in this case should be equal to approximately 1.5 microseconds. On the basis of the study, the block-diagram of the spectrometer shown in Figure 1 of the Enclosure was adopted for development. In order to reduce the number of random coincidences, a single-channel pulse amplitude analyzer was introduced into the spectrometer control circuit. Orig. art. has: 11 figures and 13 formulas.

ASSOCIATION: None

SUBMITTED: 14Aug63	DATE ACQ: 27Feb64	ENCL: 01
SUB CODE: NP, OP	NO REF SOV: 010	OTHER: 008

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ACCESSION NR: AT4019064 ENCLOSURE: 01

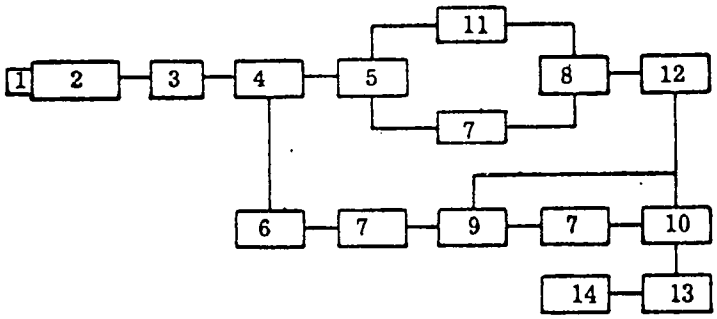

Fig. 1 - Proposed block diagram of a boron-hydrogen scintillation spectrometer: 1) C - scintillator; 2) K[illegible] - cathode follower; 3) [illegible] - photomultiplier; 4) [illegible]$_C$ - preamplifier; 5) Y_C - amplifier; 6) [illegible]Y_C - linear amplifier; 7) [illegible] - delay line; 8) CC - coincidence circuit; 9) [illegible] - blocking unit; 10) [illegible] K - electronic key; 11) OA - single-channel pulse amplitude analyzer; 12) PO - regulating monovibrator; 13) O - limiter; 14) AA - multichannel pulse amplitude analyzer.

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ACCESSION NR: AT4019068 S/0000/63/000/000/0319/0327

AUTHOR: Yegorov, Yu. A.; Orlov Yu. V.

TITLE: Use of a single crystal Gamma spectrometer for measurements on a nuclear reactor

SOURCE: Voprosy* fiziki zashchity* reaktorov; sbornik statey (Problems in physics of reactor shielding; collection of articles). Moscow, Gosatomazdat, 1963, 319-327

TOPIC TAGS: nuclear reactor, reactor shielding, spectrometer, Gamma spectrometer, single crystal spectrometer, Gamma ray, sodium iodide, cesium iodide

ABSTRACT: The absorption and amplitude distribution of γ-rays from various sources in the energy region from 0-10 Mev was studied with NaI(T1) and CSI(T1) single crystal spectrometers. It is pointed out that "total absorption" of γ-rays by a crystal is a relative concept due to the finite size of the crystal. Thus, the amplitude distribution of γ radiation consists of: a) a peak corresponding to the total absorption, and b) a continuous background due to the partial absorption. The degree of absorption completeness is determined by the magnitude of photofraction, i.e. the ratio of the area under the peak to that of a continuous distribution. It is found, in agreement with previous measurements (W. F. Miller

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ACCESSION NR: AT4019068

and W. J. Snow, Rev. Scient. Instrum. 31, 49, 1960), that the magnitude of photofraction shows an initial sharp decrease with increasing energy of the γ rays and then remains constant. The magnitude of photofraction was studied for single crystals of NaI(T1) (125 x 100 mm) and CSI(T1) (80-90 x 80-90 mm). The results are plotted in terms of the number of impulses per channel vs. the channel number. Due to the larger coefficient of absorption for γ-rays in the CSI(T1) crystal, the magnitude of photofraction was increased. The crystal efficiency vs. γ-ray energy is also plotted for these crystals. It is shown that the neutron background around a reactor can be eliminated by placing a bismuth filter of sufficient thickness for the total absorption of the γ-rays in front of the detector. In the presence of a neutron background, the number of γ-rays registered in each channel can be determined from the relation $N_\gamma = N - 1{,}3N_{Bi}$, where N is the total number registered in a channel without a filter and N_{Bi} is the number in the presence of a filter. The γ-ray spectrum from the active zone of a water reactor as measured by a CSI(T1) crystal is given in Fig. 1 of the Enclosure. The amplitude distribution spectra of γ-rays from various sources indicate that spectrometers based on NaI(T1) and CSI(T1) single crystals can conveniently be used to measure the radiation escaping from the active zone of a reactor. Orig. art. has: 11 figures and 1 formula.

ASSOCIATION: None

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ACCESSION NR: AT4019068

SUBMITTED: 14Aug63 DATE ACQ: 27Feb64 ENCL: 01

SUB CODE: NP NO REF SOV: 005 OTHER: 003

Card 3/4

ACCESSION NR: AT4019068

ENCLOSURE: 01

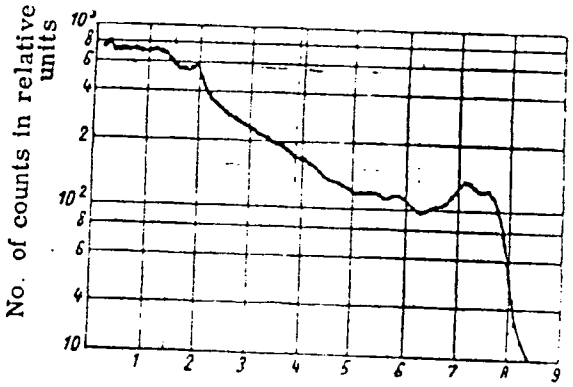

Fig. 1 - Gamma spectrum (amplitude distribution of γ-rays escaping from the active zone of a reactor through a 1-m water layer, measured by means of a CSI(T1) crystal (80 x 80 mm) spectrometer.

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ACCESSION NR: AT4019066 S/0000/63/000/000/0310/0312

AUTHOR: Yegorov, Yu. A.; Orlov, Yu. V.; Pankrat'yev, Yu. V.

TITLE: Permissible Gamma-background in measurements by a fast neutron spectrometer with a single detector

SOURCE: Voprosy* fiziki zashchity* reaktorov; sbornik statey (Problems in physics of reactor shielding; collection of articles). Moscow, Gosatomizdat, 1963, 310-312

TOPIC TAGS: neutron spectrum, Gamma-background, fast neutron, reactor shielding, spectrometer, spectrometer discrimination, photomultiplier, neutron flux measurement

ABSTRACT: The discriminating ability of a single-detector fast neutron scintillation spectrometer against a γ-radiation background was studied by two methods: separation by an electronic circuit (Brooks, F. D. Nucl. Instrum. 4, 151 (1959)), and separation based on the spatial charge saturation in the region between the last dynode and the anode of a photomultiplier (Owen, R. B. Trans. I.R.E. PGNS 5, 198 (1958)). In both cases, an FEU-33 photomultiplier was used with a stilbene crystal (30x20 mm). The energy threshold of the spectrometer was set at 0.6 Mev and determined from the reaction $D(d,n)He^3$. A Po + Be neutron source was

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ACCESSION NR: AT4019066

used and Co^{60} served as a γ-radiation source. The results are given in the Enclosure, based on data obtained by the electronic circuit separation method (Fig. 1a) and the spatial charge saturation method (Fig. 1b), respectively. As seen from Fig. 1a, γ-quanta at 1.33 Mev are not registered until the intensity of γ radiation exceeds 4mc/sec. In the spatial charge saturation method, γ-quanta are registered only if the limit of 15-20 mc/sec is exceeded. It is found, however, that γ radiation with energies greater than 3 Mev is registered. when the spatial charge saturation method is used in measurements on a nuclear reactor. This difficulty is avoided by increasing the energy threshold to 2.1 Mev It is then possible to measure a fast neutron spectrum when the ratio of neutron flux to that of γ-rays is 1:2000. Orig. art. has: 2 figures.

ASSOCIATION: none

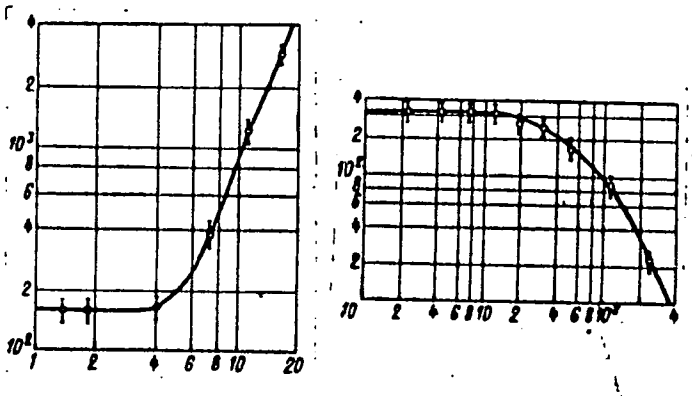
SUBMITTED: 14Aug63 DATE ACQ: 27Feb64 ENCL: 01

SUB CODE: NP NO REF SOV: 005 OTHER: 003

Card 2/3

ACCESSION NR: AT4019066

ENCLOSURE: 01



a b

Recording characteristics of a fast neutron spectrometer with a system of discrimination based on: a) comparing the full charge count with the peak count electronically; b) the γ-background of the spatial charge. In both a and b: ordinate = relative number of counts, and abscissa = γ-radiation dose in μr/sec.

Card 3/3

ACCESSION NR: AT4019061 S/0000/63/000/000/0270/0277

AUTHOR: Avayev, V. N.; Voskresensky, Ye. V.; Yegorov, Yu. A.; Orlov, Yu. V.

TITLE: Use of radioactive indicators in the investigation of shielding

SOURCE: Vorposy* fiziki zashchity* reaktorov; sbornik statey (Problems in physics of reactor shielding; collection of articles). Moscow, Gosatomizdat, 1963, 270-277

TOPIC TAGS: nuclear reactor, reactor shielding, shielding evaluation, radioactive indicator neutron detector, scintillation counter, Gamma ray, neutron

ABSTRACT: The authors suggest that the efficiency of radioactive indicators such as Al^{27}, Mn^{55}, In^{115}, I^{127} or Au^{197} can be increased by an improved method for detecting and counting the γ-rays. The advantages of using radioactive indicators as neutron detectors in the study of shielding are: (1) the ability to detect neutrons which are either above certain energy levels (threshold detectors) or within a certain energy interval (resonance detectors); (2) the smallness of the indicators (can be used without disturbing the distribution of the neutron flux); (3) insensitivity to γ radiation; and (4) ability to be used to estimate the neutron energy spectrum. The disadvantages are their small effective cross section and the relative insensitivity of the gas counters used in conjunction with the indicators to measure the γ radiation. In the present paper, in order to increase detection efficiency, a 4π

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scintillation counter was used for cylindrically shaped radioactive indicators and a 2π scintillation counter for planar indicators. 4π scintillation counters consist of two photomultipliers of the FEU-43 type, each provided with a CsI(Tl) crystal 60 mm in diameter and 30 mm in height. Both crystals are packed in one container and divided by an aluminum foil. The mounting of the photomultiplier and associated equipment is shown. The γ-ray efficiency of the 4π counter was near 100%. This allows the use of very small indicators (5 mm in diameter and 5-50 mm in height) for cylindrical specimens, the wall thickness of which can be 0.1-0.3 mm. Cylindrical indicators are mounted in a lucite tube (9 mm in diam.) with a wall thickness of 0.5 mm. With the use of cadmium or boron-cadmium filters, the total diameter is between 15 and 32 mm. Planar indicators are deposited on a lucite substrate, 1 mm thick. The dimensions of the indicators are from 5 x 5 to 40 x 40 mm with a thickness of 0.1-4 mm. FEU-41 multipliers are used with NaI(Tl) crystals (diameter and height 40 mm) for planar indicators. In order to eliminate the γ-ray background, a single-channel analysis system was used. The best technique is to count not the integral number of pulses, but the most intense γ line or group of γ lines, characteristic for a given indicator. The γ-ray energies and characteristic reactions for the most common indicators are tabulated. This method improves signal to noise ratio and eliminates the necessity of very pure materials. An example of how the use of this method enables one to eliminate the influence of

ACCESSION NR: AT4019061

thermal and epithermal neutrons in the detection of fast neutrons by a radioaluminum indicator is shown. "The authors thank D. I. Chupy*rin for assembling and adjusting the electronic apparatus and N. Ye. Vasin for designing the 4π-counter." Orig. art. has: 6 figures and 1 table.

ASSOCIATION: none

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

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

Card 3/3

ACCESSION NR: AT4019060 S/0000/63/000/000/0260/0270

AUTHOR: Avayev, V. N.; Vasil'yev, G. A.; Yegorov, Yu. A.; Kucheryayev, V. A.; Orlov, Yu. V.; Pankrat'yev, Yu. V.; Panov, Ye. A

TITLE: Counters and dosimeters for the study of shielding and shielding properties of materials

SOURCE: Voprosy* fiziki zashchity* reaktorov; sbornik statey (Problems in physics of reactor shielding, collection of articles). Moscow, Gosatomizdat, 1963, 260-270

TOPIC TAGS: counter, scintillation counter, dosimeter, shielding, reactor shielding, nuclear reactor, gamma ray, neutron

ABSTRACT: In the study of the shielding properties of different materials and their combinations, it is important to know the following parameters: coefficients of attenuation of γ-ray and neutron streams of different energies; coefficients of attenuation of the power level of γ-radiation and fast neutorns; yield and spectrum of captured γ-radiation; activation of materials in a neutrons flux; and deformation of the γ-ray and neutron spectra in their passage through the material. Since existing equipment is insufficient for shielding studies, the authors built and tested a number of scintillation counters and dosimeters.

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ACCESSION NR: AT4019060

Among those described are a scintillation counter and spectrometer for the study of the attenuation of γ-ray flux, consisting of a FEU-11B photomultiplier with an NaI(T1) crystal (diameter and height 40 mm) mounted in a housing lined with aluminum foil, and a scintillation neutron counter consisting of a FEU-11B photomultiplier with plastic scintillator of ZnS(Ag) + lucite (diameter 30, height 10 mm). For neutron energies $\geq$ 2 MeV, the γ-ray background is calibrated with a Co^{60} source and eliminated by the proper bias in the analyzer. A similar neutron counter can be used as a monitor. A light guide in conjunction with a smaller counter is used when the opening in the shielding is too small. This light guide is made of organic glass (length 60, diameter 10 mm) and is equipped with a light collector (Tove, P. A. Rev. of Sci. Inst. 27, 143 (1956)). For neutron energies between 1 and 10 Mev, a stilbene crystal is used (diameter 30, height 20 mm) equipped with the γ-discrimination arrangement described by H. W. Broch (Rev. Sci Instr. 31, 1063 (1960)). The detection efficiency for neutrons between 1 and 10 Mev is 10 - 2%. For thermal neutron detection, a FEU-29 or FEU-31 photomultiplier with an Li_2O- $3S.O_2$ glass scintillator is used. Detection is based on the reaction $Li^6 + n \rightarrow \alpha + H^3$. The sensitivity of these counters to γ rays is calibrated by Zn^{65} to Co^{60} sources. All-wave-length neutron counters are constructed as gas counters (type SNM-5) filled with BF_3 and enclosed in paraffin, which is lined on the outside with cadmium. Dosimeters for fast neutrons are

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ACCESSION NR: AT4019060

made from plastic scintillators (polystyrene + terphenyl + ROROR) attached to a FEU-25 photomultiplier. The photomultiplier current is integrated and amplified by a direct current amplifier. The maximum sensitivity of this dosimeter is 0.2 μ F/sec per division. In order to eliminate γ-ray background, the measurements are made simultaneously with a γ-ray dosimeter which is a combination of the plastic and inorganic scintillators. A crystal of CsI(Tl) (volume 1.5 cm^3) is mounted on the axis of the plastic crystal (polystyrene + terphenyl + ROROR). Finally, a universal stand for detection and power supply is described. "The authors thank V. M. Isakov, D. I. Chupy*rin, A. I. Vasil'yev, V.N. Kozy*rev and Yu. G. Anisimov for taking part in the construction and adjustment of the apparatus." Orig. art. has: 9 figures and 1 table.

ASSOCIATION: none

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

SUB CODE: NP NO REF SOV: 015 OTHER: 004

Card 3/3

ACCESSION NR: AT4019063 S/0000/63/000/000/0281/0289

AUTHOR: Avayev, V. N.; Yegorov, Yu. A.; Orlov, Yu. V.

TITLE: Computation of the characteristics of gamma-radiation and fast neutron spectrometers by the random test method

SOURCE: Voprosy* fiziki zashchity* reaktorov; sbornik statey (Problems in physics of reactor shielding; collection of articles). Moscow, Gosatomizdat, 1963, 281-289

TOPIC TAGS: nuclear reactor, reactor shielding, radiation spectrum, neutron scattering, radiation dosimetry, neutron, Gamma ray, scintillation spectrometer, crystal spectrometer, random test method, Monte Carlo method

ABSTRACT: The authors note that the most convenient devices for the study of continuous γ-radiation and neutron spectra are γ-radiation scintillation spectrometers with complete absorption of the γ-quanta energy, that is, spectrometers with a large-size scintillator, and also fast-neutron spectrometers with one sensor. The relative advantages and disadvantages of these types are discussed and the preference is accorded to spectrometers with large crystals. Processing of the test results obtained with these spectrometers is possible provided one knows the forms of the instrument lines of the monochromatic radiations at a number of energy values and the dependence of the efficiency on the energy of the gamma-

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ACCESSION NR: AT4019063

radiation and neutrons. It is pointed out that for a scintillation gamma-spectrometer in a gamma-quanta energy range of approximately 100 kev to 3 Mev, the form of the instrument line and the efficiency can be determined experimentally by measuring the gamma-spectra of radioactive sources of γ-radiation (Ce^{141}, Hg^{203}, Cs^{137}, Zr^{95}, Zn^{65}, Na^{24}, and others), but that for higher gamma-radiation energy levels and fast-neutron energies the experimental determination of the efficiency and the form of the line involve great difficulties. These values may be calculated in the case of both spectrometer types by the random test method (otherwise known as the Monte Carlo method). In the present article, a system for spectrometer characteristic computation by this method is considered. For the sake of simplifying the exposition, in both cases a plane problem is solved; that is, the authors consider that all processes of scattering and absorption occur in the xy plane. The authors note that the solution of the spatial problem does not differ essentially from that of the plane problem. The paper is in two sections: in the first-the problem of the computation of the characteristics of a gamma-spectrometer is discussed; in the second - the computation of the characteristics of a neutron spectrometer. In the first case, the movement of the γ-quanta of the source in the scintillator and the movement of the products of its scattering are sequentially examined until either they are absorbed in the crystal or fall outside its limits. For each γ-quantum of the source, a determination is made of

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the portion of the energy which is expended on ionization as a result of secondary processes. This computation is repeated for a large number of source -quanta. The results thus obtained are used to construct rated spectra - histograms (frequency polygons) which define the resolution of the spectrometer (without consideration of the physical resolution determined by the resolving power of the scintillator and photomultiplier). A comparison of the number of "absorbed" gamma-quanta with the number of those considered determines the efficiency of the spectrometer. In the second section of the article, a general description of the physical composition and operational principle of this type of instrument is given. The problem of the time lag between the moment of formation of the proton pulse and the pulse from the alpha-particle is discussed. The determination of the efficiency and resolution of a fast-neutron scintillation spectrometer, and also a rational selection of the delay time, requires the solution of a problem, formulated by the authors in the following terms: Incident to and along the axis of a cylindrical scintillator, the composition of which contains hydrogen, carbon, oxygen and boron atoms, is a stream of neutrons having an energy E_0; it is necessary to find the time t_0 from the moment of the first scattering in the hydrogen to the moment of the capture of the neutron by the boron nucleus, to determine what part of its energy the neutron has lost as a result of scattering on the hydrogen nuclei, and to find the ratio n_b/n_0, where n_0 is the stream of source neutrons, and n_b is the

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ACCESSION NR: AT4019063

number of neutrons captured by the boron after scattering in the hydrogen. Since the scattering sections of the neutrons by the hydrogen and carbon nuclei are large in comparison with the capture sections, and the capture section of the boron nuclei is great in comparison with the scattering section, it may be assumed that the hydrogen and carbon nuclei only scatter the neutrons, while the boron nuclei only absorb them. At the time, scattering and absorption by the oxygen nuclei may be disregarded, since the full section of the oxygen is small in comparison with the sections of hydrogen, carbon and boron. In both sections of the paper, the authors discuss the possible use of electronic computers in carrying out the calculations by the formulas derived. "The authors express thanks to V. N. Ignatenko for carrying out the calculations". Orig. art. has: 9 figures and 17 formulas.

ASSOCIATION: None

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

SUB CODE: NP NO REF SOV: 003 OTHER: 005

Card 4/4

S/0000/63/000/000/0312/0318

ACCESSION NR: AT4019067

AUTHOR: Avayev, V. N.; Yegorov, Yu. A.; Orlov, Yu. V.

TITLE: Gamma pair spectrometer

SOURCE: Voprosy* fiziki zashchity* reaktorov; sbornik statey (Problems in physics of reactor shielding; collection of articles). Moscow, Gosatomizdat, 1963, 312-318

TOPIC TAGS: nuclear reactor, reactor shielding, radiation dosimetry, spectrometer, Gamma spectrometer, Gamma pair spectrometer, scintillation pair spectrometer, electron position pair, annihilation radiation

ABSTRACT: The authors describe a scintillation-type gamma-pair spectrometer which is being successfully used to measure the deformation of the γ-spectra of a nuclear reactor in the shielding in the region of γ-quanta energies greater than 1.5 Mev and for the study of capture γ-radiation. When the energy of the gamma-quanta is absorbed by the material of the scintillator, annihilation γ-radiation is generated as a result of the formation of the electron - position pair, resulting in two γ-quanta, each with an energy of 0.51 Mev. If the dimensions of the scintillator are small, the annihilation γ-quanta leave it. In the scintillator, meanwhile, energy $E_\gamma = E_{\gamma 0} - 1.02$ Mev is absorbed. This circumstance makes it

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ACCESSION NR: AT4019067

possible to construct a scintillation pair spectrometer which will compare favorably with spectrometers of other types. The spectrometer circuit is so designed that only the amplitude of those pulses is measured which are caused by the absorption of γ-quanta energy resulting from the process of pair formation. For this purpose, the spectrometer sensor includes, in addition to the scintillator radieted by the γ-quanta stream of the source, two supplementary scintillators to record the annihilation γ-quanta. Further theoretical considerations are explained in the article. The advantages of a scintillation gamma pair spectrometer distinguish it favorably from γ-spectrometers of other types and particularly from single-scintillator spectrometers, even if the scintillator is large in size. The difficulties generally encountered in deciphering the results of measurements of complex γ-spectra by means of a spectrometer with a scintillator are discussed in some detail. The point is emphasized that the pair spectrometer is practically insensitive to fast neutrons. This important advantage of the scintillation pair spectrometer is particularly valuable, if the spectrometer is employed to measure γ-spectra in the presence of a neutron background - for example, in nuclear reactors. Two defects are also mentioned: 1) the efficiency of the spectrometer is not great, but in order of magnitude lies between the efficiency of a single-scintillator spectrometer and a Compton spectrometer; 2) the electronic circuitry is extremely complex. A block diagram of the scintillation gamma pair spectro-

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ACCESSION NR: AT4019067

meter discussed in this article may be seen in the Enclosure. The principle of operation is explained thoroughly in the article. As a central sensor, a spectrometric photomultiplier, type FEU-42, has been used, mounted on which there is a spectrometric NaI(Tl) crystal, 40 mm in both diameter and height. In the supplementary sensors, type FEU-43 photomultipliers, with CsI(Tl) crystals, 60 mm in diameter and 30 mm in height, have been used. The amplitude analyzer employed is a 100-channel analyzer, type AI-100-1, while standard single-channel analyzers, type AADO-1, have been placed in the control channel of the spectrometer for sampling pulses of specific amplitude. Results of various tests conducted with the spectrometer are presented and evaluated in the text. In particular, a test of the sensitivity of the gamma pair spectrometer to neutrons showed the following: 1) in the energy region of γ-quanta approximately less than 2.5 Mev, some distortion of the gamma-spectrum is possible (however, not more than 10%) which can be eliminated by means of additional measurements with a 100-mm thick bismuth filter; 2) if the ratio of neutron and gamma-quanta streams is approximately equal to unity, practically no distortions of the gamma-spectrum are observed; 3) in the case of a gamma-quanta energy value above 2.5 Mev, distortions of the γ-spectrum by the neutron background are likewise not observed. A formula is given for the computation of the efficiency of the spectrometer for a quantitative estimate of the ratios in the gamma-spectrum. Orig. art. has: 7 figures.

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ACCESSION NR: AT4019067

ASSOCIATION: None

SUBMITTED: 14Aug63 DATE ACQ: 27Feb64 ENCL: 01

SUB CODE: NP NO REF SOV: 006 OTHER: 001

Card 4/5

APPROVED FOR RELEASE: Wednesday, June 21, 2000 CIA-RDP86-00513R001238

ENCLOSURE: 01

ACCESSION NR: AT4019067

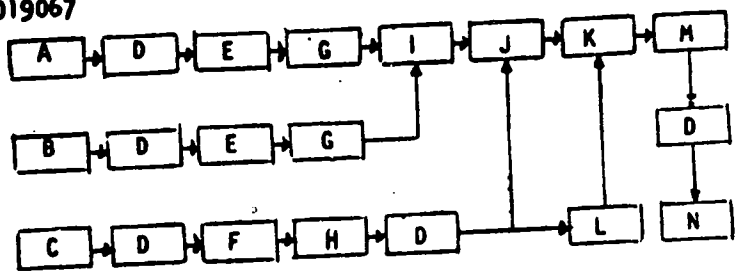

Fig. 1. Block diagram of the γ-pair spectrometer: A - central sensor of the spectrometer; B and C - supplementary lateral sensors; D - cathode followers; E - single-channel amplitude analyzers; F - linear pulse amplifier; G - shaping blocks; H and L - delay lines; I and J - coincidence circuits; K - electronic key; M - discriminator-limiter; N - 100-channel amplitude analyzer

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L 39927-65 EWG(j)/EWP(e)/EWT(m)/EPF(c)/EWP(i)/EPR/EWP(t)/EWP(b)/EWA(h)
Pr-4/Ps-4 IJP(c) JD/WW/WH
ACCESSION NR: AP4012283 S/0089/64/016/001/0032/0040

AUTHOR: Veselkin, A. P.; Yegorov, Yu. A.; Orlov, Yu. V.; Pankrat'yev, Yu. V.

TITLE: Spectra of fast reactor neutrons which have passed through graphite, lead and iron

SOURCE: Atomnaya energiya, v. 16, no. 1, 1964, 32-40

TOPIC TAGS: fast neutron spectrum, reactor neutron spectrum, neutron filter, reactor shield, biological reactor protection

ABSTRACT: The present work is a continuation of a previous work by V. N. Avaev et al, (Atomnaye energiya 15, 20, 1963). The spectra of fast neutrons were measured with the scintillation counter spectrometer which is sensitive to neutrons, but has a low sensitivity to gamma radiation. Various thicknesses of graphite, lead, and iron were used as filters for the neutrons. The computed results are compared with the experimental data and only partial agreement was found, which varied with the neutron energy. The results are given in diagrams

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L 39927-65

ACCESSION NR: AP4012263

and tables. "The authors are grateful to A. L. Barinov for his participation in the experiments, to Yu. G. Anisimov, V. N. Kozy*rev and T. V. Ruch'ev for help with measurements." Orig. art. has: 9 figures and 3 tables.

ASSOCIATION: None

SUBMITTED: 28May63 ENCL: 00

SUB CODE: NP NO REF SOV: 008 OTHER: 008

(A) L 65136-65 EWT(d)

ACCESSION NR: AP5021631 UR/0286/65/000/013/0112/0112

AUTHORS: Vasilenko, N. T.; Vasil'yev, Yu. P.; Orlov, Yu. V.; Pirskiy, P. K.

TITLE: A hinge for connecting pontoons. Class 65, No. 172643

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 13, 1965, 112

TOPIC TAGS: pontoon, mechanical fastener

ABSTRACT: This Author Certificate presents a hinge for connecting pontoons, made in the form of two brackets fixed to the flanges of adjacent pontoons and joined by an axle (see Fig. 1 on the Enclosure). To facilitate and expedite joining pontoons for floating in waves, the axle of the hinge is fixed on two radially-spherical bearings pressed into the bracket. In its central portion, the cross section of the axle is square. This square portion enters into a slot of the other bracket which also has a slot perpendicular to the first one. The second slot forms a seat for a wedge which locks the hinge when the pontoons are connected.

L 65136-65

ACCESSION NR: AP5021631 ENCLOSURE: 01

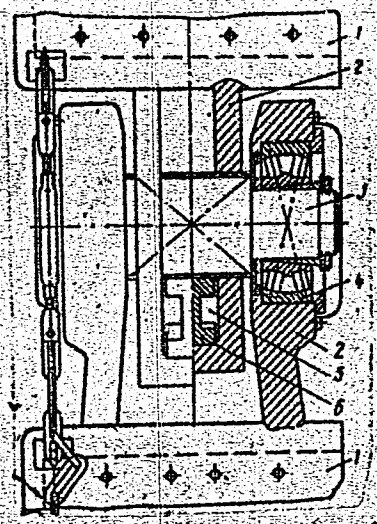

Fig. 1. 1- pontoons; 2- brackets; 3- hinge axis; 4- radially-spherical bearings; 5- slot; 6- wedge

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APPROVED FOR RELEASE: Wednesday, June 21, 2000 CIA-RDP86-00513R001238

ORLOV, Yu.V., inzh.; GORYUNOV, Yu.V., inzh.

Installation of built-in TNDM-110 current transformers. Energetik 13 no.3:20-21 Mr '65. (MIRA 18:7)

KONSTANTINOV, [illegible] V.; ORLOV, Yu. V.; BONDARENKO, V. V.

"Physical start-up of the reactor at the Beloyarsk Atomic Power Station named after I. V. Kurchatov."

report submitted for 3rd Intl Conf, Peaceful Uses of Atomic Energy, Geneva, 31 Aug-9 Sep 64.

L 23990-66 EWT(l)/EWT(m)/EPF(n)-2/EWC(m)-6 IJP(c) WW/GG

ACC NR: AP6007811 SOURCE CODE: UR/0120/66/000/001/0045/0050

AUTHORS: Orlov, Yu. V.; Sevost'yanov, Yu. A. 46, 43 B

ORG: none

TITLE: Sensitivity function of a scintillation gamma spectrometer with CsI(Tl) crystal to gamma radiation with energy up to 10 Mev 21, 19

SOURCE: Pribory i tekhnika eksperimenta, no. 1, 1966, 45-50

TOPIC TAGS: gamma spectrometer, scintillation spectrometer, radiation sensitivity, matrix element, luminescent crystal

ABSTRACT: The authors describe a procedure for constructing two matrices with uniform (50th-order) and nonuniform (42nd-order) energy interval for the reduction of apparatus spectra of a single-crystal scintillation gamma spectrometer with energy up to 10 Mev. It is assumed in the construction of the matrix that the amplitude distributions for CsI(Tl) are analogous to those of NaI(Tl) crystals with equivalent dimensions. This made it possible to use for the calculation the amplitude distributions published by M. I. Berger and

Card 1/2 UDC: 539.16.08

L 23990-66

ACC NR: AP6007811

3

I. Doggett (J. Res. Nat. Bur. Standards, 1956, 56, 355). The matrices are constructed for a cylindrical crystal CsI(Tl) of diameter and height of 80 mm, for collimated incident radiation of 50 mm diameter (this is a standard Soviet crystal size). Reduced spectra, obtained with reactor experiments with the aid of this crystal and with these matrices are presented. The accuracy of reduction by the matrix method is estimated at 15 -- 20%. The authors thank V. N. Ignatenko for help during the reduction of the experimental data, and Yu. M. Bezborodov and I. G. Voronina for computer calculations. Orig. art. has: 10 figures, 1 table, and 7 formulas.

SUB CODE: 20/ SUBM DATE: 25Dec64/ ORIG REF: 009/ OTH REF: 006

Card 2/2

L 05043-67 EWT(m)/EWP(j)/EWP(t)/ETI IJP(c) JD/JR/GD/RM

ACC NR: AT6027927 SOURCE CODE: UR/0000/66/000/000/0120/0122

39
37
B+1

AUTHOR: Yegorov, Yu. A.; Orlov, Yu. V.; Pankrat'yev, Yu. V.

ORG: None

TITLE: Titanium removal cross section for a layer in a hydrogen-containing medium

SOURCE: Voprosy fiziki zashchity reaktorov (Problems in physics of reactor shielding); sbornik statey, no. 2. Moscow, Atomizdat, 1966, 120-122

TOPIC TAGS: particle cross section, titanium, neutron cross section, research reactor

ABSTRACT: Removal cross sections for titanium were measured in a water-water reactor of the swimming pool type. Sheets of titanium measuring 70×70 cm were placed near the reactor core with dimensions of 50×43×32 cm. The removal cross section was determined from the expression

$$N(r)G(r) = N(r-d)G(r-d)e^{-\Sigma_B d},$$

where $N'(r)$ is the neutron flux at distance r; $N'(r-d)$ is the neutron flux at the distance $(r-d)$ when there is no plate; Σ_B is the macroscopic removal cross section; d is the thickness of the plate and $G(r)$ is the experimentally determined correction factor

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L 05043-67
ACC NR: AT6027927 2

for geometric attenuation. The results show a removal cross section of 1.72±0.06 barns. The removal cross sections determined for detectors with various effective energy thresholds from 1.1 to 7 Mev coincide within the limits of experimental error. The minimum distance from the plate used for the removal cross section depends on the effective threshold of the detector. For neutrons with an effective energy of 1.5 Mev in polyethylene, this distance is close to 15 cm. The distance decreases with an increase in the threshold. Orig. art. has: 3 tables, 4 formulas.

SUB CODE: 18/ SUBM DATE: 12Jan66/ ORIG REF: 006/ OTH REF: 001

Card 2/2

ACC NR: AP6032508 (N) SOURCE CODE: UR/0413/66/000/017/0075/0075

INVENTOR: Bylinkin, N. S.; Orlov, Yu. V.

ORG: none

TITLE: Hydrometric device. Class 42, No. 185506

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 17, 1966, 75

TOPIC TAGS: flow meter, remote control system, hydrometeorology, acoustoelectric transducer, hydrometric device

ABSTRACT: This Author Certificate describes a hydrometric device having 1) a hydrometric load with a current flow meter in the form of a propeller, and surface and bottom contacts, 2) a system of cables attached to shore supports, 3) reel winches driven by an electric motor, and 4) a control panel. Signals are transmitted from several sensors to the panel, by remote control, via a single core cable, using an electric circuit equipped with an acoustic frequency current generator connected to a two-diode phased current divider, whose diodes are part of the relay circuit. [Translation]

SUB CODE: 08, 13/

Card 1/1 UDC: 532.57

ACC NR: AP7002169 (A, N) SOURCE CODE: UR/0089/66/021/006/0509/0511

AUTHOR: Veselkin, A. P.; Nikitin, A. V.; Orlov, Yu. V.

ORG: none

TITLE: Investigations with the radiation loop of a water-water reactor

SOURCE: Atomnaya energiya, v. 21, no. 6, 1966, 509-511

TOPIC TAGS: water cooled nuclear reactor, reactor neutron flux, gamma flux, irradiation apparatus, radioactive source

ABSTRACT: The authors describe a test made to explain the possibilities of research with a water-water reactor, aimed at eliminating the undesirable presence of a wide range of mixed radiation with a wide energy spectrum. To this end, the water-water reactor was equipped with a radiation loop with a set of emitters of different geometric shape. The emitters were produced by passing high-purity water through the reactor, and using the irradiated water as a secondary source of radiation. The particular investigation was carried out with a source in the form of 8 mm tubing wound to make a disc of outside diameter 470 mm and inside diameter 30 mm. Measurements were made of the distribution of the γ quantum energy and of the radioactivity as functions of the distance to this type of source, and other source parameters are calculated. The radiation loop was also used to measure the relative concentration of the chemical forms of N^{16} produced in the water passing through the reactor. The loop is being reconstructed to increase its intensity. The authors thank A. V. Zhenikhova for sys-

Card 1/2 UDC: 621.039.573

ACC NR: AP7002169

tematic monitoring of the pH of the reactor water, V. V. Gerasimov for preparing the ion-exchange columns and for the measurements and a discussion of the results, Yu. G. Anisimov for help with the measurements and the data reduction, and the reactor crew for constructing and operating the loop. Orig. art. has: 2 figures and 6 formulas.

SUB CODE: 18/ SUBM DATE: 21Dec65/ ORIG REF: 001/ OTH REF: 004

Card 2/2

APPROVED FOR RELEASE: Wednesday, June 21, 2000 CIA-RDP86-00513R001238

ORLOV, Yu.Ye. [Orlov, IU.IE.]; DZYUBA, N.P.; SHOSTENKO, Yu.V.

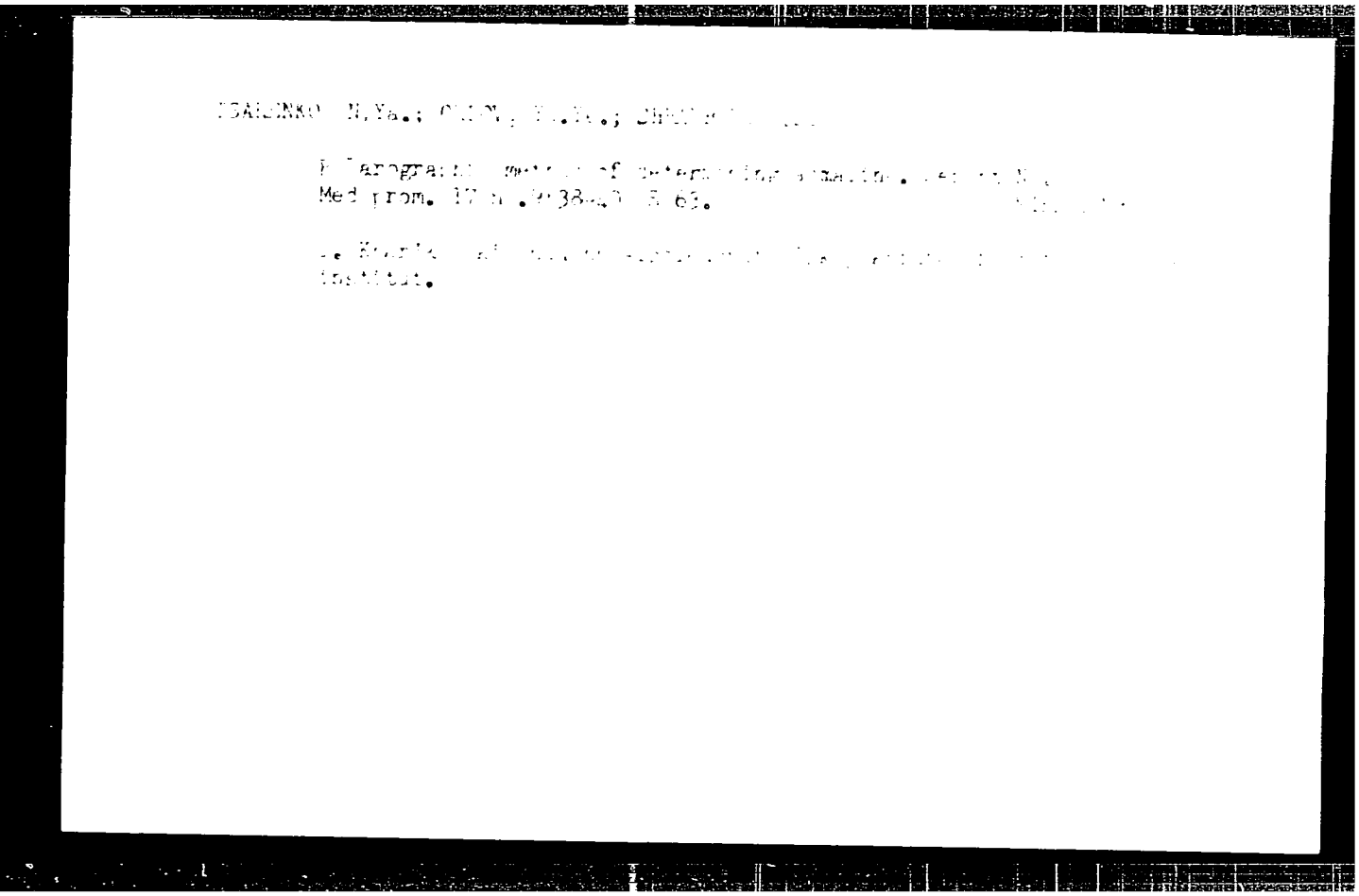
Quantitative determination of khellin in combined medicinal preparations with the use of the polarographic method. Farmatsev. zhur. 18 no.5:36-39 '63. (MIRA 17:8)

1. Khar'kovskiy nauchno-issledovatel'skiy khimiko-farmatsevticheskiy institut.

BOLOTNIKOV, S.M.; SHRAYBER, M.S.; ORLOV, Yu.Ye.

Determination of the strength of alcohol in tinctures. Apt.delo 9 no.2:62-64 Mr-Ap '60. (MIRA 13:6)

1. Iz laboratorii analiticheskoy khimii Khar'kovskogo nauchno-issledovatel'skogo khimiko-farmatsevticheskogo instituta.
(TINCTURES (PHARMACY))



[illegible], Ya.Ya.; [illegible], V.[illegible].

Determination of khellin by the use of [illegible]. [illegible]
14 no.5 52-54 '65.

1. Khar'kovskiy nauchno-issledovatel'skiy khimiko-[illegible]
icheskiy institut.

ORLOV, Yu.Ye.

Systems with scanning converters for measuring display [illegible].
Izm. tekh. no.11:1-4 N '65. (MIRA 18:11)

3/138/62/000/001/004/009
A051/A126

AUTHORS: Dobrushkin, D.B.; Ekel', Ye.S.; Orlov, Z.D.

TITLE: The construction of rubber-metal valves

PERIODICAL: Kauchuk i rezina, no. 1, 1962, 11 - 15

TEXT: Four variations of the more frequently used designs of rubber-metal valves are described. Rubber-metal valves are said to ensure optimum conditions of hermetic sealing for working pressure in the formation of a closed rubber-seat contour. Methods are recommended for determining the profile of the seat, which, in turn, ensures the formation of a closed contour. The working principle of all 4 valves is as follows: the seat is submerged in the rubber deforming it and touching part of its surface where so-called contact tensions occur. The submerging depth of the seat must be arbitrarily chosen, regardless of the method used to determine the profile of the seat. The authors then give the mathematical determination of various parameters. There are 7 figures and 7 Soviet-bloc references.

ASSOCIATION: Sverdlovskiy filial nauchno-issledovatel'skogo instituta rezinovoy promyshlennosti (Sverdlovsk Branch of the Scientific Research Institute of the Rubber Industry)

Card 1/1

DOBRUSHKIN, D.B.; EKEL', Ye.S.; ORLOV, Z.D.

Studying the conditions of the forcing of the vulcanized rubber packing through the gap. Kauch. i rez. 22 no.9:19-24 S '63. (MIRA 16:11)

1. Sverdlovskiy filial nauchno-issledovatel'skogo instituta rezinovoy promyshlennosti.

DOBRUSKIN, D.B.; EKEL', Ye.S.; ORLOV, Z.D.

Mechanism of sealing with a rubber-metal valve. Kauch. i rez. 24 no.1:19-27 Ja '65. (MIRA 18:3)

1. Sverdlovskiy filial Nauchno-issledovatel'skogo instituta rezinovoy promyshlennosti.

ROMANOVSKIY, V., kand.tekhn.nauk; ORLOVA, A., inzh.

Testing synthetic packing materials in the ship mechanism. Mor. flot 25 no.3:37-38 Mr '65. (MIRA 18:4)

1. Leningradskoye vyssheye inzhenernoye morekhodnoye uchilishche imeni admirala S.O.Makarova (for Orlova).

ORLOVA, A. A.

AUTHORS: Korshunov, I. A., Orlova, A. A. 79-1-[illegible]

TITLE: Radiochemical Investigation of the Reactions of Organometallic Compounds in Benzene Solutions (Radiokhimicheskoye issledovaniye reaktsiy metalloorganicheskikh soyedineniy v bennol'nom rastvore)

PERIODICAL: Zhurnal Obshchey Khimii, 1959, Vol. 28, Nr 1, pp. 49- 7 (USSR)

ABSTRACT: With the aid of a benzene provided with heavy hydrogen atoms Rezuvayev, I. A. and other Russian chemists showed that diphenyl mercury and oxyphenyl mercury behave differently in benzene solutions on radiation in the ultraviolet light. Whereas diphenyl mercury reacts in the direction toward the open radical mechanism, oxyphenyl mercury forms a so-called nucleus of reaction with the solvents. The present paper radiochemically investigated the behavior of these mercury compounds in benzene solutions in the case of photolysis and heating. This method excluded possible errors which are connected with a hydrogen conversion between the organometallic compounds and the deuterated benzene [illegible]ne

Card 1/3

Radiochemical Investigations of the Reactions of [illegible]
Organometallic Compounds in Benzene Solutions

radiochemical mark was as radiocarbon introduced into benzene where the reaction took place. The radioactive benzene was synthesized according to Zelinskiy from isotopic acetylene which had been produced from isotopic barium carbide. The activity of the initial benzene and the final products was calculated with the aid of a counter with internal filling of carbon dioxide. Previously the organic compound had been burned to CO_2 in the oxygen current according to the micromethod. The activity calculation was performed with an accuracy to 3%. With the aid of a benzene with carbon isotopes the authors confirmed the mechanism, suggested already earlier, of the photo- and thermo-decomposition of diphenyl mercury and oxyphenyl mercury. It was found that no conversion takes place in the systems diphenyl - benzene, lead tetraphenyl--benzene. There are 2 tables and 4 references, all of which are Slavic.

ASSOCIATION: Gor'kiy State University (Gor'kovskiy gosudarstvennyy universitet)

Card 2/3

Radiochemical Investigation of the Reactions of [illegible]
Organometallic Compounds in Benzene Solution

SUBMITTED: December 29, 1956

AVAILABLE: Library of Congress

Card 3/3 1. Organic compounds 2. Diphenal mercury 3. Chemistry

AMENITSKAYA, R.V.; BATALOV, A.P.; GLAZOV, V.M.; KORSHUNOV, I.A., prof.; KUTSEPIN, V.F.; NOVOTOROV, N.F.; ORLOVA, A.A.; PETROV, A.M.; SHAFIYEV, A.I.

[Problems in radiochemistry] Sbornik zadach po radiokhimii. [By] R.V.Amenitskaia i dr. Pod red. I.A.Korshunova. Gor'kii, Gor'kovskii gos. univ. im. I.I.Lobachevskogo, 1959. 91 p. (MIRA 15:11)

1. Prepodavateli khimicheskogo fakul'teta Gor'kovskogo gosudarstvennogo universiteta im. N.I.Lobachevskogo (for all)
(Radiochemistry)

KORSHUNOV, I.A.; BATALOV, A.P.; ORLOVA, A.A.

Radiochemical study of radical exchange in certain organometallic compounds. Radiokhimiia 1 no.6:679-682 '59.
(MIRA 13:4)
(Radicals(Chemistry)) (Organometallic compounds)

5 (3)

AUTHORS: Korshunov, I. A., Amenitskaya, R. V., Orlova, A. A., Batalov, A. P.

SOV/79-29-6-48/72

TITLE: Radiochemical Investigation of the Reciprocal Exchange of the Radicals in Some Systems (Radiokhimicheskoye issledovaniye obmena radikalami v nekotorykh sistemakh)

PERIODICAL: Zhurnal obshchey khimii, 1959, Vol 29, Nr 6, pp 1992-1995 (USSR)

ABSTRACT: In a previous paper (Ref 1) the reciprocal exchange of the radicals was investigated in the following systems by means of the radioactivated isotope C^{14}: diphenyl mercury - benzene, phenyl mercury hydroxide - benzene, tetraphenyl lead - benzene, in the heating and irradiation with ultraviolet light. The analysis of the experimental data shows that the reciprocal exchange of the radicals takes place according to the open radical mechanism or over an intermediate formation of reaction complex with the solvent. Moreover, the degree of the exchange which depends on the composition of the reacting system and the conditions of the reactions makes it possible to determine the mobility of the individual radicals in the compounds to be investigated. In the present report the

Radiochemical Investigation of the Reciprocal Exchange of the Radicals in Some Systems SOV/79-29-6-48/72

investigation results of the reciprocal exchange of the phenyl- and ethyl radicals is described for the following systems: $C_6H_5HgBr - \overset{*}{C}_6H_5Br$, $C_6H_5HgBr - \overset{*}{C}_6H_6$, $C_6H_5MgBr - \overset{*}{C}_6H_5J$, $C_6H_5MgBr - \overset{*}{C}_6H_6$, $C_2H_5MgBr - \overset{*}{C}_2H_5Br$, $(C_2H_5)_4Pb - \overset{*}{C}_2H_5Br$, $(C_6H_5)_4PJ - \overset{*}{C}_6H_5J$, $(C_6H_5)_4PJ - \overset{*}{C}_6H_6$ and $(C_6H_5)_2O - \overset{*}{C}_6H_6$. It is shown that the reciprocal exchange of the phenyl radicals in organomercury compounds and the ethyl radicals in organolead compounds takes place only in the presence of additions e.g. cobaltous chloride, aluminum bromide, metallic silver. It was found that the exchange of the phenyl radical in organomagnesium and organophosphorus compounds, with or without additions, does not take place (2 tables). There are 2 tables and 4 Soviet references.

Card 2/3

Radiochemical Investigation of the Reciprocal Exchange of the Radicals in Some Systems

SOV/79-29-6-48/72

ASSOCIATION: Gor'kovskiy gosudarstvennyy universitet (Gor'kiy State University)

SUBMITTED: December 9, 1957

Card 3/3

S/065/62/000/009/001/002
E075/E436

AUTHORS: Kolesnikov, I.M., Panchenkov, G.M., Orlova, A.A.

TITLE: The kinetics of the alkylation reaction of toluene with propylene using alumino-silicate catalyst

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TEXT: As the reaction was considered to be suitable for the preparation of chemically pure cymenes, its kinetics were investigated in a flow system at atmospheric pressure. Thermodynamic calculations have shown that at the molar ratio of toluene to propylene of 3:1, the alkylation should be carried out at a temperature not greater than 260°C. The composition of the catalyst was: (%) Al_2O_3 - 14.01; SiO_2 - 84.66; NaO - 0.36; Fe_2O_3 - 0.13; Zn and MgO - traces. It was regenerated by air at 550°C. The rate of feed of toluene into the reactor was from 0.4 to 1.8 x 10^{-2} mole per 1 cc catalyst/hour. It was shown that for all the reaction temperatures investigated (180, 200, 220, 240 and 260°C) the yields of products decreased with the increasing rate of toluene feed into the reactor. The conversion of propylene exceeded that of toluene, as a result its conversion into

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cymenes, diisopropyltoluenes and coke. The yield of cymenes increased with temperature and reached a maximum (73% of gram moles of propylene or 24.3% of toluene taken for the reaction) at 240°C. On the basis of results obtained and thermodynamic calculations, the process was described by an irreversible parallel-consecutive reaction of the second order occurring in the gaseous phase

$$A + B \xrightarrow{k_1'} A_1 + B \xrightarrow{k_2''} \nu_1 A_2 + \nu_2 A_3$$

where A - toluene; B - propylene; A_1 - cymenes; A_2 - diisopropyltoluenes; A_3 - coke; ν_1 and ν_2 - stoichiometric coefficients; k_1', k_2'' - reaction rate constants for the first and second reaction stages. The reaction rate constants k_1 and k_2 and their ratio $K = k_2/k_1$ were calculated. The apparent energy of activation for the first stage was found to be 9.5 kcal/mole and the second stage 6.7 kcal/mole. The pre-exponential factors in the Arrhenius equation were 39.8 mole/cm^3 and 3.8 mole/cm^3 for the first and second reaction stages respectively. There are 4 figures and 3 tables.

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