

SHAPINEL, V. S.

Radiations of Iridium¹⁹², Silver¹¹⁰, and Indium¹¹⁵. V. S. Shapnel and N. V. Porafontov (Moscow State Univ.)
Zh. eksp. i teoret. fiz. 21, 1370-83 (1951). The photo-electron spectrum of Ir¹⁹² was measured by a spectrometer with a transverse magnetic field with axial symmetry. The energy values obtained for the Ir¹⁹² γ -rays agree with earlier data obtained on the basis of conversion electrons. The β -spectra and the spectra of the conversion electrons of Ag¹¹⁰ and In¹¹⁵ were studied. For In¹¹⁵, γ -rays with energies of 553 and 711 e.kv. were observed. The β -spectrum of Ir¹⁹² was obtained by means of a spectrometer with 2 magnetic lenses. *RMF* J. Rovtar Leach

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BETA SPECTROMETER WITH TWO MAGNETIC LENSES
AND INTERNAL CORRECTING COILS. V. S. Shpinel, Zhur.
Ekspit'. 1 Teoret. Fiz. 22, 255-6(1952) Feb. (In Russian)

A β -ray spectrometer is sketched, and a curve obtained
therewith of the conversion electrons of 90-hr Nb^{93m} is
presented. The K/L conversion-coefficient ratio was found
to be 2.5 ± 0.5 . (O.Y.)

SHPINEL, V.S.

USSR/Electricity - Ionization Losses Apr 52

"Measurements of Fluctuations of Ionization Losses for Electrons in Thin Layers of Substances," V. S. Shpinel, Moscow State U

"Zhur Eksper i Teoret Fiz" Vol XXII, No 4, pp 421-424

In a beta-spectrometer curves of distribution of ionization losses in Al 1.65 and 3.96 mg/sq cm thick were measured for electrons of energies of 148 and 222 keV. Exptl values of probable losses agree well with theory, provided correction is made for longer path due to scattering. However,

215T25

the obtained distribution is noticeably wider than in the theoretical curve of Landau. Indebted to R. I. Moshkina and M. Z. Shtal. Received 21 Jun 51.

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USSR :

Similar conditions in heavy isobaric nuclei. V. S. Shomer
(Moscow State Univ.). *Zhur. Ekspil. i Teori.* **1963**, No. 2, p. 247-251.
(1963).—Two tables are given showing the excitation energy
and the excited and ground states of odd-even and even-odd
nuclei. The elements are grouped in pairs with their proton
nos. differing by 2 units ($\Delta Z = 2$). The difference in excita-
tion energies is small in the case of odd neutrons, and in the
case of odd protons it is smaller for the isobar with larger Z ,
showing that a change in the state of neutrons causes little
change in the Coulomb energy of the nucleus. A 1-particle
model is therefore a satisfactory approximation. S. P.

PMZ

USSR/ Nuclear Physics

Card 1/1 Pub. 43 - 3/11

Authors : Shpinel', V. S.

Title : ~~The life span of the first excited state of Li⁷ from observations of the Doppler effect and gamma-ray aberration~~

Periodical : Izv. AN SSSR. ser. fiz. 18/1, 65-75, Jan-Feb 1954

Abstract : Experiments show that the method based on the measurement of the Doppler effect can be very effective for estimating the life span of excited states of nuclei with $\tau \sim 10^{-12}$ sec. It was determined that the application of the Doppler effect method is not limited only to the problem of determining the life span of excited states but can also be applied to the study of nuclear collisions for the purpose of explaining the origin of radiation in the range of greater energies. The results obtained by measuring the state of alpha-particles of Po²¹⁰ excited with Li⁷ nuclei are listed. Thirteen references: 4-USSR; 1-German and 8-USA (1935-1952). Table; graphs; drawings.

Institution : The M. V. Lomonosov State University, Moscow

Submitted : December 25, 1953

USSR/Nuclear Physics - Gamma rays of technetium

FD-1495

Card 1/1 : Pub 146-18/20

Author : Shpinel, V. S.

Title : Gamma-rays of Tc⁹⁵ (Letter to the editor)

Periodical : Zhur. eksp. i teor. fiz., 27, 387-388, Sep 1954

Abstract : Attempts to verify experimentally data by H. Medicus (Helv. Phys. Acta 23, 299 (1950)). Tabulates energies of gamma-rays emitted in K-capture by Tc^{95,m} and Tc⁹⁵. Two Swiss and one USSR references.

Institution : Moscow State University

Submitted : May 22, 1954

Shpinel, V. S.

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✓ Decay scheme for zirconium-97 and niobium-97. N. N. Lebedev, A. A. Suvorin, N. V. Kuznetsov, and V. S. Shpinel (Moscow State Univ., U.S.S.R.). *Nuclear Phys.* 2, 687-705 (1966/67). - See C.A. 57, 4537b. R. W. Fink

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SHPINEL, V.S.

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✓ 3609

LUMINESCENCE SPECTROMETER INVESTIGATIONS OF
Ir¹⁹² STRONG γ EMISSION, N. N. Delvagin, G. A. Kuznet-
sova, and V. S. Shpinel (Lomonosov Moscow State Univ.);
Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 909-12(1956) Aug.

(In Russian)

Measurements were made of Ir¹⁹² γ radiation in the
strongest range of γ transitions. The analysis of relative
transition intensities, the Ir¹⁹² decay scheme, and com-
parison of the experimental data with theoretical formulas
are presented in diagrams and tabulations. (R.V.J.)

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SHPINEL, V. S.

✓ 3610
 THE DECAY SCHEME OF Zr^{91} AND Nb^{91} . N. N. Delyagin,
 A. A. Sorokin, N. B. Fofanov, and V. S. Shpinel.
 (Lomonosov Moscow State Univ.). *Izvest. Akad. Nauk*
 S.S.S.R. Ser. Fiz. 20, 913-24 (1956) Aug. (In Russian)

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During the conference on Nuclear Spectroscopy in 1955, a report was made describing the studies of Zr^{91} and Nb^{91} decay scheme which had been investigated by the method of β - γ and γ - γ coincidences. The method permitted the separation of the soft β spectra for Zr^{91} and Nb^{91} from the total β spectra of $Zr^{91} + Nb^{91}$, and revealed the γ - γ coincidence with the intensity of ~10%. The energy of cascade quanta, evaluated by the absorption method was found to be ~0.7 Mev and >1 Mev. To obtain a more accurate result the work has been repeated and measurements checked on im-

proved apparatus and the results of the work are given.
 (R.V.J.)

R.V.J.
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Shpinel, V. S.

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STUDIES OF DOUBLE-LENS SPECTROMETERS AND THE
IMPROVEMENT OF ANNULAR FOCUSING. Ya. I. Gaziev,
K. P. Mitrofanov, and V. S. Shpinel (Moscow, Lomonosov
State Univ., 2nd Research Inst. of Physics) Izvest. Akad.
Nauk S.S.S.R., Ser. Fiz. Mat. Nauk, 1961, 15(1) Dec. (In Russian)

Experimental investigations were made of double-lens
spectrometer focusing properties and of the annular fo-
cusing improvement achieved by internal correcting coils.
The construction scheme, electric parameters, and the
effects of the internal coil are shown. R. V. J. k3/

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ŠPINEL', V. S.

SUBJECT USSR / PHYSICS
AUTHOR ŠPINEL', V. S., GROJS, O. Š.
TITLE Vertical Focussing in a Spiral- β -Spectrometer.
PERIODICAL Zurn. techn. fis, 26, fasc. 10, 2259-2268 (1956)
Issued: 11 / 1956

CARD 1 / 2

PA - 1585

This work deals with the computation of spatial trajectories in a spiral- β -spectrometer. The character of the magnetic field: If the pole shoes generating the spectrometer field are cylindrical the magnetic field can be approximately be subdivided into a homogeneous and an inhomogeneous domain. For the existence of a spirals shaped trajectory it is necessary that the magnetic field be reduced more rapidly than $1/r$. The electron is then not able to move steadily along the "boundary orbit" $r = R$. Spatial motion: Next, the motion of the electrons emitted at a certain angle in the direction of the central plane is investigated. The equations are written down. The motion of the electron can then be considered to be a motion in a conservative field of force with the potential U . All possible trajectories of the electron emitted with initial velocity are within one boundary surface. The boundary surface has the shape of a surface of revolution with plane contour. Next, the orbit of the electron on this surface of revolution is dealt with. For the purpose of illustrating the character of focussing in the vertical plane the motion in a field generated by two fictitious charges is investigated. Such a field is analogous to that on which interest is focussed here and which is generated by two cylindrical pole ends. An equation for the boundary contour is hereby

500-PMK

5356. AN INVESTIGATION OF CHAINS OF RADIOACTIVE TRANSITIONS. V.S. Shpinel and G.A. Kuznetsova. Zh. eksper. teor. fiz. i teo. fiz. No. 2, 211-42 (1956) in Russian

A spectroscopic investigation of radioactive transitions $Zr^{92} - Nb^{91} - Mo^{91} - Ru^{94} - Te^{92}$; $Ru^{94} - Rh^{93} - Pd^{93}$ and $Ru^{101} - Rh^{101}$ was carried out by means of a β -spectrometer with two magnetic lenses and a NaI(Tl) scintillation γ -spectrometer. As a whole the results agree with the published decay schemes. In addition, a β -transition with a maximum energy of 0.15 MeV was observed in the Rh^{101} source. β -rays have been detected from Rh^{101} . Corresponding β - and γ -transitions have been found in odd nuclei differing by two units.

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89-8-7/26

AUTHOR
TITLE

VINOGRADOV, A.V., SHPINEL, V.S.
The Phosphate-Oxyquinoline Separation Method and the Volumetric
Determination of Zirconium.
(Fosfatno-oksikhinolinovyy metod otdeleniya i obyemnogo opredeleniya tsirkoniya -Russian)
Atomnaya Energiya, 1957, Vol 3, Nr 8, pp 130-134 (U.S.S.R.)

PERIODICAL
ABSTRACT

THE newly developed method is based upon the well-known phosphate method for the separation of zirconium and the determination of zirconium as oxichynalate. It is explained for the first time how zirconium oxichynalate is separated from an oxalate-containing solution after the phosphate precipitation was dissolved in oxalic acid. The conditions are given for the separation of zirconium of titanium and thorium from the phosphate precipitation and of niobium and tantalum from the oxichynalate precipitation. By means of this method it is possible to determine small quantities of zirconium (2-5 mg) with an accuracy of up to $\pm 2-4\%$. The following results show the advantages offered by this method:

Weighed-in Zx quantity: Determined Zx quantity:

Separation of zirconium from oxalate-containing solution	3,44 mg	3,42 mg
Separation of zirconium as phosphate with following transformation into oxichylate	1,72 mg	1,71 mg.

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Shpinel', V. S.

48-12-7/15

AUTHORS: Parfenova, V. P. , Forafontov, N. V. , Shpinel', V. S.

TITLE: Investigation of the Ce^{144} -Decay According to the Method of β - γ -Coincidence (Issledovaniye raspada Ce^{144} metodom β - γ -sovpadeniy)

PERIODICAL: Izvestiya AN SSSR, Seriya Fizicheskaya, 1957, Vol. 21, Nr 12, pp. 1601 - 1606 (USSR)

ABSTRACT: The method of the β - γ -coincidence was here employed for determining the β -transitions of small intensity. When this method is employed the partial- β -spectra occur more distinctly, as the β -particles of the Ce^{144} -transition in the original Pr^{144} -state, as well as the β -transitions of Pr^{144} which render the deciphering of the primary β -spectrum difficult are not recorded in such measurements. The measurements were performed by means of the apparatus, exactly described in references 6 and 7, consisting of a two-lens- β -spectrometer and a luminescence- γ -spectrometer. But some modifications were made: the inner coils were abandoned, according to reference 8 a diaphragm was inserted in the domain of the ring-image, and the light-conductor of plexiglass was replaced by one of polystyrene. It is shown here that the β -s spectra of the coincidence with three different ranges of the γ -spectrum are complicated. The β -spectrum ($E_{\beta} = 310$ keV) drops out of these β -spectra. This due⁴ to the

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Shpinel, V. S.

48-12-8/15

AUTHORS: Mitrofanov, K. P. ; Shpinel', V. S.

TITLE: Further Investigation of Electron-Focusing in a Two-Lens- β -Spectrometer (Dal'neysheye izucheniye fokusirovki elektronov v dvukhlinzovom β -spektrometre)

PERIODICAL: Izvestiya AN BSSR, Seriya Fizicheskaya, 1957, Vol. 21, Nr 12, pp. 1607 - 1613 (USSR)

ABSTRACT: The focusing properties of the two-lens- β -spectrometer **БМЛ -1** with different lens-positions and the influence of the correcting outer coil were investigated by means of an electron-cannon. The method employed here was already earlier used and is described in detail in reference 1. For supplementing that method the construction of the electron-cannon was improved here and an additional movable diaphragm was inserted. The latter permits to modify the size of the angle of flight of electrons α without disturbing the vacuum. The measurement of the displacement of luminous places on the screen in modifications of the focusing current or displacement of the screen gave the possibility of determining the performance characteristics of the spectrometer and to draw the electron-trajectory-diagrams for different lens-positions. It is shown that the spherical aberration is diminished by drawing apart the lenses.

Card 1/3

Shpinel', V.S.

PA - 2692

AUTHOR:
TITLE:

DELYAGIN, N.N., SHPINEL', V.S.

On the even Nuclei having the Characteristic 2+ for the second Excited State. (O chetno-chetnykh yadrakh, imeyushchikh dlya vtorogo vozbuzhden'nogo sostoyaniya kharakteristiku 2+, Russian) Zhurnal Eksperim. i. Teoret. Fiziki, 1957, Vol 32, Nr 2, pp 373-374 (U.S.S.R.)

Reviewed: 6 / 1957

PERIODICAL:

Received: 5 / 1957

ABSTRACT:

As is well known even-even nuclei as a rule have in their ground state the spin 0 and positive parity (characteristic 0+), and in their first excited state they have the spin 2 and positive parity (characteristic 2+). But there is no such general rule for the second excited states, where characteristics 4+, 2+, and also others are found. If the sequence of the characteristics 0+-2+-4+ (corresponding to the ground state and the first two excited states) can be successfully explained (at least within the domain of highly deformed nuclei), the sequence 0+-2+-2+ cannot be satisfactorily explained at present. It is interesting to investigate the experimental data on the nuclei at present known with such a sequence of characteristics.

Fe⁵⁶, Zn⁶⁶, Se⁷⁶, Kr⁸⁴, Cd¹¹⁰, Sn¹¹⁶, Te¹²², Te¹²⁶, Xe¹²⁶, Xe¹²⁸, Os¹⁸⁶, Pt¹⁸⁸, Pt¹⁹², Pt¹⁹⁴, Hg¹⁹⁸, Hg²⁰⁰.
The nuclei with Z > 36 are grouped in close proximity of the

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On the even Nuclei having the Characteristic $2+$ PA - 2692
for the secon Excited State.

values $Z = 50$ and $Z = 82$ at which the normal proton shells are filled up. Such a distribution of these nuclei may be connected with their deformation. As the parameters of the deformation of these nuclei aren't known, $\delta = (\Delta Z + \Delta N)/2$ is taken as relative measure of nuclear deformation. Here ΔZ denotes the absolute value of the difference between the Z of the nucleus and that value of Z which is nearest to it (which corresponds to the filled shell). For all nuclei investigated here $4 \leq \delta \leq 12$ can be applied. This interval probably corresponds to nuclei with average deformation, and excitation is probably vibrationlike. The nes distribution of the intensities of the two competing γ transitions in favor of direct transition with increasing δ can be explained by means of an increase of the contribution made by the component $E 2$ to a mixed transition with increasing deformation. (1 illustration)

ASSOCIATION: Moscow State University.
PRESENTED BY:
SUBMITTED:
AVAILABLE: Library of Congress.
Card 2/2

SHPINEL', V. S., Doc Phys-Math Sci -- (diss) "Studies in the field of β - and γ -spectroscopy." Mos, 1958. 19 pp (Mos State Univ in M. V. Lomonosov, Sci Res Inst of Nuclear Physics), 100 copies. Bibliography: pp 17-19 (44 titles) (KL, 18-58, 94)

β - beta
 γ - gamma

AUTHORS: Delyagin, N. N., Shpinel', V. S. SOV/48-22-7-20/26

TITLE: Life of the First Excited State of the Mg^{24} -Nucleus
(Vremya zhizni pervogo возбuzhdennogo sostoyaniya yadra Mg^{24} .)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 7, pp. 861-866 (USSR)

ABSTRACT: The life of the first excited state (1,37 MeV) of the Mg^{24} -nucleus was measured by means of the resonance scattering of γ -quanta. A source of gaseous Na^{24} was used. At first the theory underlying this method is exposed. In order to increase the energy of the incident quanta up to the resonance level the method of cascade transitions (Ref 8) was used. Formula (3): $v > E_0/Mc$ gives the condition the quanta must comply with, if they are to have an energy sufficient for a resonance excitation. (E_0 denotes the quantum energy, and M the nuclear mass). The computation of the effective cross-section leads to the computation of the micro-spectrum of the incident quanta as represented by the function $f(E)$. In the decay scheme of

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SOV/48-22-7-20/26

Life of the First Excited State of the Mg^{24} -Nucleus

$Na^{24} \rightarrow Mg^{24}$ the quantum with 1,37 MeV is preceded by a quantum 2,75 MeV and by a β radiation with a maximum energy of 1,39 MeV. Thus the condition (3) is superfulfilled. The indeterminacy introduced by the selection of a variant of the theory of β -decay is taken into account in the computation of the effective cross-section of resonance scattering according to formula (4),

which gives formula (5): $\sigma = \frac{(1,93 \pm 0,04) \cdot 10^{-38}}{\tau}$, τ denoting the

life of the 1,37 MeV state of the Mg^{24} -nucleus. The influence of the state of aggregation of the source substance is examined. It appears that the above results only hold, when the recoil nuclei have a sufficiently long time of free flight. This is achieved by using a gaseous source. The experimental procedure is described. The scattered γ -quanta are recorded by a NaJ(Tl)-crystal and a photomultiplier. The pulses coming from the latter are amplified and then led into a differential discriminator. The resonance scattering of the γ -quanta was measured at five different temperatures of the source ranging from 800 to 880°. The counting rate of the scattered quanta at 860° amounted to 22 pulses per minute on an average, which

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AUTHORS: Gnedich, A. V., Kryukova, L. N., SOV/48-22-7-21/26
Murav'yeva, V. V., Shpinel', V. S., Shumshurov, V. I.

TITLE: On the Problem of Doppler Broadening of Lines of Conversion
Electrons Emitted by Recoil Nuclei (K voprosu o dopplerovskom
ushirenii liniy konversionnykh elektronov, ispuskayemykh yadrami
otdachi)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958,
Vol. 22, Nr 7, pp. 867 - 870 (USSR)

ABSTRACT: When Bi²¹² (ThC) decays by an emission of an α -particle to Tl²⁰⁸
(ThC"), this Tl nucleus exhibits a transition from an excited
state with 40 keV to the ground state. The Doppler effect ex-
hibited by these conversion lines is investigated. At first
a plane source of infinite extension is investigated. The thick-
ness of the slab exerts a considerable influence on the conver-
sion lines. The shape of the conversion lines was investigated
with a helical focusing- β -spectrometer. An active thorium
deposit served as a source. The theoretical shape of the lines
was computed under the assumption, that the mean life τ of the
level of 40 keV is within the range $T < \tau < t$. (τ denotes the life
of the excited state, and T the slowing-down period of the

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On the Problem of Doppler Broadening of Lines of
Conversion Electrons Emitted by Recoil Nuclei

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nuclei in the target). The Doppler effect leads to a broadening of the lines towards high energies. The experimentally obtained B-line well agrees with the theoretical one. This broadening of lines towards high energies was also found with A α lines (L $_{II}$ of the same transition, $E_e = 25$ keV). The authors checked whether this effect could be caused by distortions of line shape due to the apparatus. The observed broadening of the B- and A α -conversion lines is actually caused by the Doppler effect. As a summary it is stated that the investigation of the line shape of conversion electrons (emitted from moving nuclei) permits to estimate the life τ of the corresponding levels of the nucleus. The analysis of the line shape must take into consideration the actual experimental condition and in particular the thickness of the source. The life can also be estimated by determining the reduction of intensity of the lines due to the emission of recoil nuclei from the source, if the thickness of the source is known. The analysis of the line shape of the conversion spectrum of moving nuclei is also necessary in the estimation of the relative intensities of the conversion lines. There are 5

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On the Problem of Doppler Broadening of Lines of
Conversion Electrons Emitted by Recoil Nuclei

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figures and 9 references, 4 of which are Soviet.

ASSOCIATION: Moskovskiy gos. universitet im.M.V.Lomonosova (Moscow State
University imeni M.V.Lomonosov)

Card 3/3

SOV/48-22-8-17/20

AUTHOR: Shpinel', V. S.

TITLE: Level Displacements and the Probabilities of Corresponding β - and γ -Transitions in Odd Nuclei (Smeshcheniye urovney i veroyatnosti sootvetstvennykh β - i γ -perekhodov v nechetnykh yadrakh)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 8, pp. 995 - 1001 (USSR)

ABSTRACT: In this paper the author analysed and classified the experimental evidence available on the excited states of odd nuclei. Similar problems were already discussed in the papers given by references 1-4. Proceeding from the model of independent particles it could be expected that nuclei with an equal number of odd particles above the closed shell exhibit similar state spectra. Such nuclei either have an even number of neutrons or an even number of protons. The distances between the levels and the properties of the even nucleon group vary as the number of pairs in the even nucleon group. It appeared to be of interest to explain the character of these modifications. The diagrams (Figs 1-6) permit to draw the following conclusion: The dis-

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Level Displacements and the Probabilities of Corresponding β - and δ -
Transitions in Odd Nuclei

placement curves are slightly curved and they change their direction when the levels filled up by the even particles are changed. This property can be used to determine the order of filling-up of the levels in the nucleus. The evidence furnished by the investigation primarily showed that the model of independent particles is an absolutely reasonable approximation even in the consideration of such special problems as the level displacement. The deviation of the displacement curves from a linear function can be considered to be due to the modification of the interaction energy of the odd particles with a proton pair when the number of particles in the core of the nucleus is changed. In other words, this interaction energy in the general case depends on the potential well in which the interacting particles are located. If the deviations in the wave functions vary continuously from one nucleus to another as can be assumed according to the shape of the displacement curves, also the matrix elements of the γ -transitions must modify continuously. Figures 7 and 8 show that the curves plotted according to the experimental points exhibit the

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Level Displacements and the Probabilities of Corresponding β - and γ -
Transitions in Odd Nuclei

expected continuous course in cases where also the corresponding displacement curves have a continuous course. It is known that matrix elements of certain multipoles exhibit a considerable fluctuation for various nuclei. The fluctuations of the matrix elements of the $M4$ -transitions are comparatively small. Continuous modifications of the wave functions of the states must also appear in the probability of the corresponding β -transitions. The probabilities of the β -transitions are dependent on the wave functions of the initial states of a nucleus and on the wave function of the final state in the other nucleus. The curves of $\lg \text{ pf}$ versus the even number of neutrons for corresponding β -transitions (Fig 10) show that the probabilities of the corresponding β -transitions in most cases do not vary greatly and apparently in a continuous manner. There are 10 figures and 7 references, 3 of which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo
gos. universiteta im. M. V. Lomonosova (Scientific Research
Card 3/4

SOV/48-22-8-17/20

Level Displacements and the Probabilities of Corresponding β^- and γ^-
Transitions in Odd Nuclei

Institute of Nuclear Physics at the Moscow State University
(named after M. V. Lomonosov)

Card 4/4

INOPIN. Ye V

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Varshalovich, D.

TITLE: The VIII Annual Congress of Nuclear Spectroscopy (VIII yezhogodnoye soveshchaniye po yadernoy spektroskopii). I

PERIODICAL: Uspekhi fizicheskikh nauk, 1958, Vol. 65, Nr. 4, pp. 721 - 722 (USSR)

ABSTRACT: The 8th Congress of Nuclear Spectroscopy took place in Leningrad from January 27 to February 3, 1958. It was attended by 300 scientists from the USSR, further by scientists from China, France, Poland, Czechoslovakia, Hungary, Eastern Germany, Yugoslavia, and the Mongol Democratic Republic. 4 main lectures and about 90 reports were heard. The main lectures dealt with problems concerning nuclear models, the α - and β -decay, γ -radiation, internal conversion, and nuclear isomerism. B.S. Dzhelapov, corresponding member, Academy of Sciences, USSR, opened the conference. Lectures were given by: V.Yu. Gonchar, Ia. V. Inopin, B.I. Zhurav, L.K. Peker (BAU SSSR-Library of USSR), M. Shirokov (KSC-Moscow State University), L.I. Sliv (LPI-Leningrad Physical-Technical Institute) et al. on levels in Mg^{24} , Mg^{25} and Al^{27} , D.C.

Alkhozov, A.P., Grinberg, G.M., Guinakiy, K.I., Ferofshina and I.Kh.Lemberg (LPI) on having found no rotational levels at 3(1) MeV in Cr, In, and Mn nuclei. The same research work is also reported on the discovery of vibrational levels in W^{182} , W^{184} , W^{186} nuclei by means of the method of the Coulomb (kilon) excitation at Excc ~ 1 Mev. L.K. Peker (BAU SSSR) gave a survey report: "Concerning Some Particulars in Vibrational Levels of Deformed Nuclei". Lectures were held also by: D.P. Zuretskiy (AN SSSR - AJSER) on radiation transitions in deformed nuclei with the spin $\sim 7/2$, L.S. Shpinai, Z. MFI MGU (Zhu Scientific Research Institute of PUYEKO, Moscow State University) on the level structure and the probability of correlation β \rightarrow β transitions in odd nuclei, D.P. Zuretskiy (AN SSSR - AJSER) on the influence of the deformation on the β \rightarrow β transitions in the nuclei of Li , $Li^{6,7}$, $Li^{8,9}$ (AN SSSR - AS USSR) on the existence of light nuclei with high neutron or proton excess; V.A. Kravtsov (LPI-Leningrad Polytechnic Institute) on the formation of nucleon pairs in nuclei; L.I. Gol'din, A. D. Piliye, G.M. Novikova, K.A. Ter-Martirosyan (TTL AN SSSR)

on alpha decay on rotational levels of odd nuclei; V.G. Sosov (AN SSSR - AS USSR) on alpha decay of nonspherical nuclei (survey); A.Y. Alkhanov, G.P. Veliseyev, V.A. Lyubimov, V.V. Brazhler (TTL AN SSSR) on polarization experiments, 190 at electrons emitted in the β -decay of Ta^{180} , Lu^{177} , Ag^{107} , Sr^{87} , Re^{186} ($\Delta I = 0, 1, \dots, \Delta \pi = -1$) as well as in that of Sr^{90} and Y^{90} ($\Delta I = 2, \dots, \Delta \pi = -1$); V.P. Rudakov (AN SSSR - AS USSR) on measurements of the (β - γ) angular correlations in Ba^{135} -decay; E.A. Burgov and Yu.V. Terakhov (TTL AN SSSR) on investigations of the electron-neutron correlations and the resonance scattering of γ -radiation; B.K. Merinov and I.M. Madzhafar (MGU-Moscow State University) on the transmission of ^{90}Y , ^{137}Cs longitudinally polarized electrons; the scattering of ^{90}Y from longitudinally polarized electrons; the action of the scattering of polarized electrons and positrons on polarized electrons; Ya.P. Chudara and I.Ya. Taub (Siga) on the determination of the intensity of the components of the complex β -spectrum according to the Fermi diagram; I.M. Bund, L.R. Zyrmanova, and Yu.P. Suslov, LGU (Leningrad State University) on the computation of the probability of the permitted and of the forbidden capture of electrons by β \rightarrow β nucleus.

SOV/20-121-4-13/54

21(7)
AUTHORS:

Delyagin, N. N., Shpinel', V. S.

TITLE:

The Resonance Scattering of Gamma-Quanta on Nuclei of Mg^{24}
(Rezonansnoye rasseyaniye gamma-kvantov na yadrakh Mg^{24})

PERIODICAL:

Doklady Akademii nauk SSSR, 1958, Vol 121, Nr 4, pp 621-622
(USSR)

ABSTRACT:

This paper investigates the resonance scattering of γ -quanta (which were generated by the decay $Na^{24} \rightarrow Mg^{24}$) on Mg^{24} nuclei in order to measure the life of the first excited state (with the energy 1,37 MeV) of the Mg^{24} nucleus. In the emission and in the absorption, a part of the energy of the quantum is spent for the recoil of the nuclei. This energy loss is relatively low, but it is much higher than the width of the excited level. In order to bring about the resonance scattering, the energy of the quanta must be restored to the former value of the resonance energy. In the investigated case such a completion occurs because of a β - γ cascade (which preceded the emission of a quantum of 1,37 MeV) in the decay

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SOV/20-121-4-13/54

The Resonance Scattering of Gamma-Quanta on Nuclei of Mg^{24}

scheme of Na^{24} . After the emission of the β -particle and of the first γ -quantum, (275 MeV), the excited nucleus Na^{24} begins to move, and the quantum of 137 MeV is emitted already by the moving nucleus. Therefore the energy of the quantum is changed according to Doppler's law. Therefore, the energy is recompleted for a certain part of the γ -quanta. For putting this mechanism into operation the free length of path of the recoil nuclei must be sufficiently high. This condition is satisfied only in a gaseous source, and therefore the author used vapors of radioactive sodium as a source. An explicit formula is given for the cross section of the resonance scattering. The form of the micro-spectrum will depend on the variant of the theory of the β -decay. There is a certain indefiniteness (only a few per cents) in the calculation of the cross section since this variant is not known. A diagram demonstrates the micro-spectrum of the incident quanta for the scalar variant of the theory of the β -decay. The width (and therefore also the life) of the level is found by a comparison of the measured cross section with the calculated one. The measuring apparatus was described in a previous paper. The resonance effect was intensified by

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SOV/20-121-4-13/54

The Resonance Scattering of Gamma-Quanta on Nuclei of Mg^{24}

an increase of the temperature. The measured dependence of the effect on the temperature agrees correctly with the theoretically calculated dependence. The measured cross section of the resonance scattering was equal to $(1,14 \pm 0,23) \cdot 10^{-26} \text{ cm}^2$ and this gives the value $\tau = (1,7 \pm 0,4) \cdot 10^{-24} \text{ sec}$ for the lifetime of the excited (1,57 MeV) state of Mg^{24} . For the quadrupole moment and the deformation parameter the values 0,7 barn and $\beta = 0,59$ were found. There are 1 figure and 5 references, 2 of which are Soviet.

PRESENTED: March 18, 1958, by D. V. Skobel'tsyn, Academician

SUBMITTED: March 11, 1958

Card 3/3

85859

S/048/59/023/012/003/009
B006/B060

24.6810
AUTHORS: Bedesku, A., Mitrofanov, K. P., Sorokin, A. A., Shpinel', V.S.
TITLE: Investigation of the Te^{131} Decay Scheme ($T_{1/2} = 30$ Hours)
PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959,
Vol. 23, No. 12, pp. 1434 - 1444

TEXT: The knowledge, how far the neutron levels $3s_{1/2}$, $1h_{11/2}$, and $2d_{3/2}$ are occupied in a number of iodine isotopes, plays an important part in nuclear shell theory. According to it the authors investigated thoroughly the decay scheme of $^{131}_{52}\text{Te}_{79}$, of which β -decay excites the levels of the isotope $^{131}_{53}\text{J}_{78}$. The specimen was prepared by bombardment of highly purified metallic Te with thermal neutrons. For Te^{130} , occurring with an abundance of 34.49% in the natural isotopic mixture, a (n, γ) -reaction was initiated producing simultaneously two Te^{131} isomers: one with a half-life of 30 h (activation cross-section < 8 mb) and another with a half-life of

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Investigation of the Te^{131} Decay Scheme
($T_{1/2} = 30$ Hours)

85859

S/048/59/023/012/003/009
B006/B060

25 min (0.22 b). After the establishment of an equilibrium between both isomers and after the total decay of the 25 min - Te^{131} created directly by the (n, γ) process, the specimen was dissolved in concentrated nitric acid. The J^{131} , created by Te^{131} decay, was extracted by carbon tetrachloride. Tellurium dioxide served as source with low specific activity due to the small activation cross-section of the 30 h - Te^{131} . The γ -spectrum of this specimen purified of iodine, was measured by a scintillation γ -spectrometer. The measurements took several days because the contribution of the long-lived Te-isotopes and of other impurities had to be estimated. Fig. 1 shows a section of the Te^{131} -spectrum (energy range 500 - 1,400 kev) and Fig. 2 shows the same for the range of 700 - 2,400 kev. Data on the relative intensities of the lines are shown in Table 1 (related to the intensity of the 780 kev line - 100). Transitions with 2.2 and 1.85 Mev were found, and instead of the 1.15 Mev transition (Ref. 6) two with 1.12 and 1.20 Mev were found. A telescope with smaller solid angle was applied to the investigation of the hard region of the spectrum, and the transitions with 1.6, 1.85, and 2.2 Mev

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Investigation of the Te^{131} Decay Scheme
($T_{1/2} = 30$ Hours)

S/048/59/023/012/003/009
B006/B060

were found to correspond to transitions and do not occur by superpositions. Fig. 3 shows the spectrum of the conversion electrons in the range of 600 - 1,300 keV, the L- and K-photopeaks corresponding to γ -transitions with 780, 850, 925, 1140, and 1220 keV. Further the β - γ - and the γ - γ -coincidence spectra were investigated. Fig. 4 shows the block diagram of the equipment applied to the measurement of the so-called "summing coincidences". The spectrum of γ -rays accompanied by β -particles is shown in Fig. 5 for $E_{\beta} > 1$ MeV and in Fig. 6 for $E_{\beta} > 1.4$ MeV. The best noticeable peak is at 147 keV; it is assumed that this peak corresponds to the first excited level of J^{131} . Further details of the γ - β -coincidence spectrum are to be seen in Figs. 7 and 8. Figs. 9, 10, and 11 show the weak part of the γ -spectrum in coincidence with 780 keV γ -rays, the spectrum of the "summing coincidences" ($E_{\text{sum}} = 770$ keV) and the part of the electron conversion spectrum of Te^{131} with the 780 and 850 keV lines. The 780 keV transition ends in the ground state of ${}_{53}^{131}\text{J}^{78}$. For both these aforementioned lines the multipolarities E1 and E2 are assumed, and the internal

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S/048/59/023/012/003/009
B006/B060

Investigation of the Te^{131} Decay Scheme
($T_{1/2} = 30$ Hours)

conversion coefficients for these lines are given (theoretical and experimental data) in Table 2. Finally particulars with reference to the proposed decay scheme (Fig. 12) and the complete results of investigations are discussed. According to the shell model $1g_{7/2}$ is regarded as the ground state and $2d_{5/2}$ as the first excited level (147 kev). Fig. 13 illustrates the level distance $2d_{5/2} - 1g_{7/2}$ for different iodine isotopes as a function of the even neutron number. The authors thank Yu. M. Ukrainskiy, N. P. Rudenko, O. M. Kalinkina, as well as L.P.Sorokina and V. V. Skvortsov, students of the Physics Department of Moscow State University, for their assistance. There are 13 figures, 2 tables, and 24 references: 4 Soviet.

X

ASSOCIATION: Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gos. universiteta im. M. V. Lomonosova (Scientific Research Institute of Nuclear Physics of the Moscow State University imeni M. V. Lomonosov)

Card 4/4

5(2)
AUTHORS:

Vinogradov, A.V., Shpinel', V. S.

SOV/32-25-9-12/53

TITLE:

On the Determination of Zirconium in the Presence of Niobium and Tantalum According to the Phosphate- and Hydroxyquinoline Methods

PERIODICAL:

Zavodskaya laboratoriya, 1959, Vol 25, Nr 9, pp 1067-1068 (USSR)

ABSTRACT:

A method for the precipitation of zirconium in form of its hydroxyquinoline (I) in the presence of Nb and Ta in a strongly ammoniacal medium and a subsequent volumetric determination were described in a previous paper (Ref 3). In the present case the behavior of Nb and Ta in the Zr precipitate as a phosphate (II) or (I) was tested with the aid of radioactive isotopes. The already known conclusion that without H_2O_2 (III), Nb and Ta are completely coprecipitated with (II) was confirmed. The presence of (III) which little influences the coprecipitation of Ta, obstructs, however, the coprecipitation of Nb (Tables 1, 2); however, only with small Zr quantities and individual precipitation of Zr (without Nb) may be expected. It was already reported (Ref 3), that 2.88 mg Zr in the presence of 8 - 18 mg Nb and 25 mg Ta may be determined by a precipitation as (I). With a

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On the Determination of Zirconium in the Presence of Niobium and Tantalum According to the Phosphate- and Hydroxyquinoline Methods SOV/32-25-9-12/53

pH 10.7 - 11.5 Nb does not influence the determination, nor does the partially coprecipitated Ta disturb the Zr determination (Tables 3-5). The investigations led to the following conclusions: In the (II)-precipitation along with (III) a partial coprecipitation of Ta occurs. The gross of Nb remains in solution. The larger the coprecipitated Nb quantity is, the larger is the precipitated Zr quantity, so that (as mentioned above) a separation is only possible with negligible quantities of Zr and Nb. The application of a successive precipitation with (II) and then (I) permits a complete separation of small quantities of Zr (2.88 mg) from Ta and Nb (Ref 3). With larger quantities a repeated precipitation of zirconium as (I) could possibly render satisfying results. Also referred to are other possibilities for Zr separation, as i.e. by extraction (Ref 3). There are 5 tables and 4 Soviet references.

Card 2/2

S/OAR/EG/GC: 012/009/011
8019/8056

AUTHORS:

Sochkin, A. A., Budaevskii, A., Klizmanitskaya, M. V.,
Kruskova, L. M., Mityushina, A. P., Morozova, T. V.,
Shtakov, V. N., Chandra, S., and Ushakov, V. S.

TITLE:

Study of the Decay of Ta^{118} and Ta^{119} and the Level Scheme
of Sb^{119}

PERIODICAL:

Izvestiya Akademii nauk SSSR Seriya fizicheskaya, 1960,
Vol. 24, No. 12, pp. 1482-1491

TEXT: The present paper was read at the 10th All-Union Conference on Nuclear Spectroscopy, which was held in Moscow from January 19 to January 27, 1960. The neutron-deficient tellurium isotopes were obtained by one and a half hours' irradiation with 600-Mev protons at GINEL (Joint Institute of Nuclear Research). The tellurium was chemically separated 1-2 days after irradiation. The measurements of the f -spectrum and the f - f coincidences were carried out by means of a scintillation spectrometer. The f - f coincidences were measured by means of a f -spectrometer. Card 1/4

TEXT: which was connected with a coincidence circuit with a f -spectrometer. The f -spectrum of Ta^{118} consists essentially of a component with the upper edge at 2100 ± 50 keV, as shown by an exact investigation. This f -spectrum is furnished by the isotope Sb^{118} , which is in equilibrium with Ta^{118} . On the basis of these results, the authors assume that the Ta^{118} and Sb^{118} decay mainly into the ground state of the daughter nuclei. For the ground state of Sb^{118} , 0^+ , and for the initial state of Sb^{118} , 0^+ or 1^+ is given. 6.1 ± 0.1 days are given as the half-life of Ta^{118} . From investigations carried out with the scintillation- f -spectrometer, in which Sb^{118} , Ta^{121} and Ta^{123} were detected, the authors are able to state that all f -transitions having a half-life of 4.75 days are related to the decay of Ta^{119} . They are transitions between the Sb^{119} levels. From a thorough study of these lines and the angular correlation of the f -radiation, the authors were able to set up the decay scheme of Ta^{119} shown in Fig. 4. Finally, Card 2/4

the authors deal with the Ta^{119} isomers. They arrive at the conclusion that the isomer of Ta^{119} with a half-life of 4.75 days is an excited isomeric state with the spin $1/2^+$ and that the state of Ta^{119} with a half-life of 12 hours is the ground state. The authors thank V. M. Yakhov for producing the source, and L. Vasina, S. A. Korshakova and M. M. Trushchinskaya for carrying out measurements and evaluating experimental results. There are 10 figures and 12 references, 10 Soviet, 3 US, and 1 Dutch.

S/OAR/EG/GC: 012/009/011
8019/8056

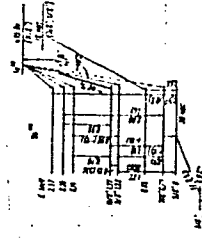


Fig. 4. Decay scheme of Ta^{119} isomers and Sb^{119} daughter nucleus.

SHPIVEL, V.S.

21 (8)

AUTHORS:

Bedesku, A., Mitrofanov, K. P.,
Sorokin, A. A., Shpinel', V. S.

SOV/56-37-1-55/64

TITLE:

The Decay of Te^{131} ($T_{1/2} = 30$ hours) (Raspad Te^{131} ($T_{1/2} = 30$ chas))

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37,
Nr 1, pp 314 - 315 (USSR)

ABSTRACT:

Te^{131} -decay has already been investigated in a number of papers, and in reference 3 also a decay scheme, basing upon the energy equilibrium in β - and γ -transitions was published. The authors of the present "Letter to the Editor" have set up an exact scheme of the lower levels of J^{131} (excited in the decay of the isomer Te^{131}) for which purpose a number of new data concerning the γ -transitions in Te^{131} were used. The investigations were carried out in a magnetic lens spectrometer and a scintillation spectrometer connected in coincidence. The Te^{131} -source was obtained by the irradiation of metallic tellurium of high chemical purity by slow neutrons. The measured γ -intensities at the en-

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SOV/56-37-1-55/64

The Decay of Te^{131} ($T_{1/2} = 30$ hours)

ergies 780, 850, 925, 1140, 1220, 1600, 1850 and 2200 keV accounted to 100, 40, 15, 35, 25, 5, 2, 0.5 % in the same order. The transitions 80, 100, 147, 240, 330, 440 and 590 keV were found both in single spectra and in the spectra of $\beta\gamma$ - and $\gamma\gamma$ -coincidences; (147 keV - first excited state of J^{131} , 780 keV - ground state). Table 2 shows the results obtained by determining the conversion coefficients onto the K-shell:

E_{γ} [keV]	$\alpha_k^{exp} \cdot 10^3$	$\alpha_k^{theor} \cdot 10^3$			Identification
		E1	E2	M1	
780	0.8 ± 0.2	0.84	2.3	3.0	E1
850	1.6 ± 0.6	0.71	1.9	2.5	E2 (+ M1)
147	260 ± 50	-	330	220	M1 + E2

The life-time of the 147 keV level was determined as amounting to $T_{1/2} = (8 \pm 1) \cdot 10^{-10}$ sec., which is in good agreement with reference 5. The decay scheme of T^{131} found by the authors is

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SOV/56-37-1-55/64

The Decay of Te^{131} ($T_{1/2} = 30$ hours)

shown by a figure. There are 1 figure, 2 tables, and 6 references, 1 of which is Soviet.

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

SUBMITTED: April 8, 1959

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82612

The Hyperfine Structure of γ -Rays, Produced
by Quadrupole Interaction in the Crystal
Lattice

S/056/60/039/001/028/029
B006/B063

underwent linear acceleration within certain limits. Measurements were carried out at the temperatures of liquid nitrogen. The X-radiation of tin (26 kev) was almost completely absorbed by a palladium film 0.06 mm thick. The γ -quanta passing through this filter were recorded by means of an NaI(Tl) crystal. The pulses coming from the single-channel pulse-height analyzer were linearly phase-modulated in a radio device, viz. simultaneously with the changes in the source velocity. The modulated pulses were fed into a 100-channel pulse-height analyzer of the type AM -100 (AI-100). Each channel corresponded to a certain velocity of the source. The measurements were made with two absorbers containing Sn119, namely, metallic tin and SnNb₃ alloy. The dependence of resonance absorption on the velocity of the source for a tin specimen 20 mg/cm² thick is shown in the upper part of the Fig. on p. 221. The curve has three peaks at 0 and ± 1.46 mm/sec (velocity of the source). This corresponds to a hyperfine structure of the 23.8-kev level, and is explained by the interaction between the quadrupole moment of the nucleus in the excited state (spin 3/2) and the electric field of the crystal.

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84972

S/056/60/039/003/058/058/XX
B006/B070

29.6210

AUTHORS:

Delyagin, N. N., Shpinel', V. S., Bryukhanov, V. A.,
Zvenglinskiy, B.

TITLE:

Nuclear Zeeman Effect in Sn¹¹⁹ 19

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960,
Vol. 39, No. 3(9), pp. 894 - 895

TEXT: The present "Letter to the Editor" is the continuation of a previous paper (Ref.4) in which the authors reported on measurements of the dependence of resonance absorption of 23.8-kev gamma quanta emitted in the Sn^{119m} decay on the velocity of the source relative to the absorber. The authors have again carried out analogous measurements, but this time the absorber was placed in an external constant magnetic field. In this case, a Zeeman splitting of the absorption line took place, and a hyperfine splitting was observed in the spectrum, from which the magnetic moment of the excited 23.8 kev level of Sn¹¹⁹ could be determined. The

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84972

Nuclear Zeeman Effect in Sn¹¹⁹S/056/60/039/003/058/058/XX
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gamma source was a foil of white metallic tin (94% of Sn¹¹⁸) exposed to thermal neutron irradiation in a reactor. The absorber was SnNb₃ in which no quadrupole splitting of the 23.8 keV level takes place according to Ref. 4. Thus, the observed hyperfine splitting of the absorption line is only a consequence of the Zeeman effect. For the measurements, the source and the absorber were cooled to nitrogen temperature. The absorber (20 mg/cm² SnNb₃) was placed between the pole pieces of a magnet producing a constant magnetic field of 12,150 oe in the absorber, and the measurements were made with and without a magnetic field. The ground level is split in two and the excited one (3/2) in four sub-levels under the action of the field. 6 M₁ transitions are possible between these. By changing the velocity of the source (positive and negative velocity) 12 lines must be observable. The shape of the absorption spectrum is dependent on the magnetic moments $|\mu_0|$ and $|\mu|$ of the ground and excited states of the Sn¹¹⁹ nucleus; on the relative signs of these moments; and on the quadrupole splitting Δ of the excited state. The results of the measurements are represented in a diagram

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Nuclear Zeeman Effect in Sn¹¹⁹

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B006/B070

(ordinate : counting rate; abscissa : velocity of the source and the corresponding energy shift). The distance between the hyperfine structure components was determined from the spectral measurement to be

$\Delta = (1.2 \pm 0.2) \cdot 10^{-7}$ ev. This is in good agreement with the value obtained in Ref. 4. From the positions of the three maxima, μ_0 was found to be

$-(1.1 \pm 0.3)$ nuclear magnetons and the moment of the 23.8 keV level to be

$\mu = +(1.9 \pm 0.4)$ nuclear magnetons. This value is considerably higher than that given by the single-particle model. A. I. Alikhanov and V. A. Lyubimov are mentioned. There are 1 figure and 5 references:

3 Soviet, 1 German, and 1 French.

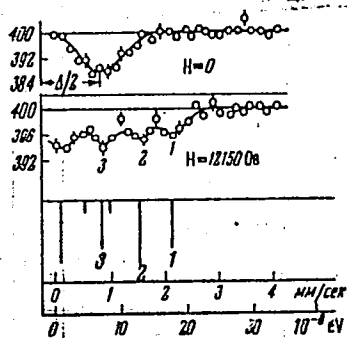
ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University)

SUBMITTED: July 4, 1960

Card 3/4

84972

S/056/60/039/003/058/058/XX
B006/B070



Card 4/4

VINOGRADOV, A.V.; SHPINEL', V.S.

Composition and properties of zirconium hydroxyquinolate obtained
from an oxalate medium. Zhur.neorg.khim. 6 no.6:1338-1341 Je
'61. (MIRA 14:11)

(Zirconium compounds) (Quinoline)

STRIGACHEV, A.T.; NOVIKOV, L.S.; SOROKIN, A.A.; KHALKIN, V.A.; TSVETKOVA,
N.V.; SHPINEL', V.S.

Investigating neutron-deficient Tb isotopes. Izv. AN SSSR. Ser.
fiz. 25 no.7:813-825 J1 '61. (MIRA 14:7)

1. Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo
gosudarstvennogo universiteta im. M.V. Lomonosova i Ob "yedinennyy
institut yadernykh issledovaniy.
(Terbium--Isotopes)

BEDESKU, A.; KALINKINA, O.M.; SOROKIN, A.A.; FORAFONTOV, N.V.;
SHPINEL', V.S.

Decay scheme of Te^{131m} . Zhur. eksp. i teor. fiz. 40 no.1:91-100
Ja '61. (MIRA 14:6)

1. Institut yadernoy fiziki Moskovskogo gosudarstvennogo
universiteta.

(Tellurium—Decay)

BRYUKHANOV, V.A.; DELYAGIN, N.N.; ZVENGLINSKIY, B.; SHPINEL', V.S.

Energy shift of gamma-ray transition observed in the
resonance absorption of γ -quanta in crystals. Zhur.
eksp. i teor. fiz. 40 no.2:713-714 F '61. (MIRA 14:7)

1. Institut yadernoy fiziki Moskovskogo gosudarstvennogo
universiteta.

(Gamma rays)

MITROFANOV, K.P.; SHPINEL', V.S.

Resonance absorption of 23.8 Kev. gamma rays by Sn^{119} , as observed
from conversion electrons. Zhur. eksp. i teor. fiz. 40 no. 3:983-985
Mr '61. (MIRA 14:8)

1. Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.
(Gamma rays) (Tin--Isotopes) (Electrons--Emission)

SHPINEL', V.S.; BRYUKHANOV, V.A.; DELYAGIN, N.N.

Temperature effect on the hyperfine structure of gamma-radiation. Zhur. eksp. i teor. fiz. 40 no.5:1525-1527 My '61.

1. Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.

(Gamma rays) (Spectrum, Atomic)

26688
S/056/61/041/005/003/038
B104/B108

24,7480 (1055,1160,1555)

AUTHORS: Delyagin, N. N., Shpinel', V. S., Bryukhanov, V. A.
TITLE: Resonance absorption of 23.8 kev γ -quanta by Sn^{119} nuclei in crystals
PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 5(11), 1961, 1347-1358

TEXT: The resonance absorption of 23.8-kev γ -quanta by Sn^{119} nuclei in SnO_2 , SnO , $\beta\text{-Sn}$, and SnNb_3 crystals was studied. Sn^{119m} in SnO_2 was used as gamma source. The authors derived the formula

$$\epsilon(\nu) = \kappa f \left(1 - \frac{1}{\pi} \int_{-\infty}^{+\infty} \frac{\exp[-C/(1+x^2)]}{1+(x+y)^2} dx \right), \quad (5)$$

which enables them to calculate the shape of the absorption spectrum measured by experiment. Γ is the total width of an absorption level, ν the relative velocity between source and absorber, f is the absorption

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S/056/61/041/005/003/038

B104/B108

Resonance absorption of ...

probability of a γ -quantum without recoil, n is the number of atoms on 1 cm^2 of the absorber, κ is a parameter determining the contribution of the investigated γ -quanta to the overall counting rate. The line width in the resonance absorption spectrum as a function of the thickness of the absorber is derived from formula (5). This formula is discussed for cases where 1) the source contains nuclei of an isotope, 2) the emission lines are split up, the absorption lines are not split, and 3) the absorption lines are split, too. Because of quadruple interaction, the Sn^{119} ground state is not split (spin $1/2$). Consequently the absorption spectrum consists of two lines of equal intensity. The distance between these two lines is

$$\Delta = \frac{1}{2} e^2 Qq_{zz} \left(1 + \frac{1}{3} \eta^2\right)^{1/2},$$

where Q is the nuclear

quadrupole moment, and η is a parameter of asymmetry. For a given velocity v_0 the unsplit emission line coincides with one of the two components of the split absorption line. Resonance absorption is then

$$\epsilon(v_0) = \kappa f \left(1 - \frac{1}{\pi} \int_{-\infty}^{+\infty} \frac{\exp\left\{-\frac{C}{2} \left(\frac{1}{1+x^2} + \frac{1}{1+(x+y)^2}\right)\right\}}{1+x^2} dx\right), \quad (11).$$

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26688
S/056/61/041/005/003/038
B104/B108

Resonance absorption of ...

The resonance absorption of the compounds mentioned above as a function of the velocity of the absorber relatively to the source was determined at nitrogen and room temperatures with an experimental device shown in Fig. 1. The SnO₂ source was prepared from tin enriched in the Sn¹¹⁸ isotope up to 92% and irradiated by thermal neutrons in a reactor. The absorption probability without recoil was determined from the dependence of $\epsilon(v)$ on the absorber thickness. Results are given in the table. The calculation of f' is possible if the phonon spectrum of a real crystal is known. Calculation of f' in Debye approximation is discussed. F. L. Shapiro (UFN, 72, 685, 1960), V. A. Lyubimov, A. I. Alikhanov (Izv. AN SSSR, seriya fiz., 24, 1076, 1960), K. P. Mitrofanov, V. S. Shpinel' (ZhETF, 40, 983, 1961), and Yu. M. Kagan are mentioned. The authors thank N. Ye. Alekseyevskiy for valuable discussions. There are 7 figures, 1 table, and 20 references: 7 Soviet and 13 non-Soviet. The 3 most recent references to English-language publications read as follows: W. Visscher, Ann. of Physics, 2, 194, 1960; H. J. Lipkin, Ann. of Physics, 2, 332, 1960; S. De Benedetti, G. Lang, R. Ingalls, Phys. Rev. Lett., 6, 601, 1961.

Card 3/6

26688

S/056/61/041/005/003/038
B104/B108

Resonance absorption of ...

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

SUBMITTED: April 27, 1961

Fig. 1. Experimental device. Legend: 1) Pulley; 2) cam; 3) contact disk
of the amplitude modulation device; 4) holder for absorber; 5) source;
6) palladium filter; 7) lead collimator; 8) low temperature vessel;
9) absorber; 10) lead collimator; 11) NaI(Tl) crystal; 12) photomultiplier.

Card 4/6

S/056/61/041/006/014/054
B113/B104

AUTHORS: Shpinel', V. S., Bryukhanov, V. A., Delyagin, N. N.
TITLE: Isomeric energy shifts of the 23.8-keV γ -transition in the
Sn¹¹⁹ nucleus
PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41,
no. 6(12), 1961, 1767-1770

TEXT: The authors measured the isomeric shifts of the 23.8-keV γ -transition in the Sn¹¹⁹ nucleus in various tin compounds. An Sn^{119m}O₂ preparation served as source which was kept at room temperature. The absorber consisted of various crystalline tin compounds and was kept at nitrogen or room temperature. In SnF₂, the absorption line is split into two components due to quadrupole interaction of the excited Sn¹¹⁹ nucleus with the gradient of the electric field in the crystal. The isomeric shift δ with respect to the energy of the γ -transition in the SnO₂ crystal was determined at room temperature. There was no quadrupole splitting in the absorption spectrum of the SnCl₂ crystal. Besides in β -Sn and SnO,

Card 1/3

S/056/61/041/006/014/054
B113/B104

Isomeric energy shifts of the ...

quadrupole splitting was only observed in SnF_2 : $\Delta = (15.5 \pm 2.5) \cdot 10^{-8}$ ev. Δ did not much depend on temperature. Measurements of energy shifts for various compounds showed that there were no distinct rules governing the isomeric shifts of the 23.8-kev γ -transition in the Sn^{119} nucleus. It may be assumed that for bivalent compounds the two p-electrons in the outer shell of the tin atom play a special role in the chemical bond; the valency electrons of the following shell, the two s-electrons, affect the chemical bond in tetravalent compounds only, and lead to a sharp change of the isomeric shift. Hence, it follows that the density of the s-electron wave function in the region of the nucleus is lower in tetravalent than in bivalent compounds. Comparing the isomeric shift of bi- and tetravalent tin compounds one may put down:

$E_{\text{II}} - E_{\text{IV}} \sim (R_{\text{exc}}^2 - R_0^2) [|\psi(0)|_{\text{II}}^2 - |\psi(0)|_{\text{IV}}^2]$, where R_{exc} and R_0 are the effective radii of the charge of the Sn^{119} nucleus in the excited and ground state, $\psi(0)$, the electron wave function in the region of the nucleus. $R_{\text{exc}}^2 > R_0^2$, i.e., the effective radius of the charge distribution grows when the Sn^{119} nucleus is excited. Since quadrupole interaction exists, the magic proton core of the Sn^{119} nucleus is not spherically

Card 2/3

Isomeric energy shifts of the ...

S/056/61/041/006/014/054
B113/B104

symmetric. There are 2 figures, 1 table, and 9 references: 5 Soviet and 4 non-Soviet. The four references to English-language publications read as follows: O. C. Kistner, A. W. Sunyar. Phys. Rev. Lett., 4, 412, 1960; S. De Benedetti, G. Lang, R. Ingalls. Phys. Rev. Lett., 6, 60, 1961; I. R. Walker, G. R. Wertheim, V. Jaccarino. Phys. Rev. Lett., 6, 98, 1961; A. J. F. Boyle, D. St. P. Bunbury, C. Edwards. Proc. Phys. Soc., 77, 1062, 1961.

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

SUBMITTED: July 1, 1961

Card 3/3

SHPINEL', V.S.

5/120/62/000/001/003/061
E032/E514

AUTHORS: Bryukhanov, V.A., Delyagin, N.N., Zvonglinskiy, B.,
Sergeyev, S.A. and Shpinel', V.S.

TITLE: Measurement of the resonance absorption spectra of
gamma-rays in crystals

PERIODICAL: Priory i tekhnika eksperimenta, no.1, 1962, 23-28

TEXT: In a previous paper (Ref. 5; Zh. eksperim. i teor. fiz.,
1960, 59, 220; Ibid 40, 715) the authors described an apparatus
which was used to investigate the Mossbauer effect (23.8 kV
gamma-rays on Sn¹¹⁹ nuclei in crystals). In this apparatus the
relative velocity of the source and the absorber is varied
linearly with time with the aid of a mechanical device and the
intensity of the gamma-rays corresponding to different values of
this velocity is recorded with a multi-channel kicksorter and an
amplitude modulator working in synchronism with the device
producing the above velocity variation. In the present note the
authors give a more detailed description of the apparatus,
including both the mechanical and the electronic parts of it. A
typical absorption spectrum for a SnO₂ crystal (9 mg/cm² target
Card 1/2

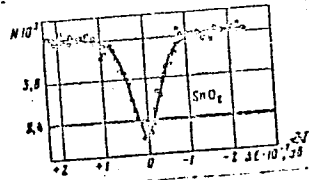
Measurement of the resonance ... S/L20/62/000/001/003/061
E032/E514

and 6 mg/cm² source, both at room temperature) is shown in Fig.6
It is reported that the width of the 23.8 keV excited state of Sn¹¹⁹
is $(2.6 \pm 0.25) \times 10^{-8}$ eV. There are 6 figures.

ASSOCIATION: Institut yadernoy fiziki MGU
(Institute of Nuclear Physics MGU)

SUBMITTED: June 15, 1961

Fig.6



Card 2/2

S/188/62/000/003/001/012
B111/B112

11-14-60

AUTHORS: Vasilev, Ts. B., Forafontov, N. V., Shpinel', V. S.

TITLE: Study of the decay types of Ce^{144} by the coincidence method

PERIODICAL: Moscow Universitet. Vestnik. Seriya III. Fizika, astronomiya, no. 3, 1962, 3-16

TEXT: The decay types of Ce^{144} in an odd-odd Pr^{144} nucleus are studied by means of a β -spectrometer and a luminescence $\beta(\gamma)$ -spectrometer in coincidence circuit, using $\beta-e^-$, e^-e^- and $e^-\gamma$ coincidences to explain certain problems. The results are in agreement with the decay scheme of I. S. Geiger et al. (Nucl. Phys., 16, 1, 1960). The $\beta-e^-$ and e^-e^- coincidence measurements were performed both upon all electrons (total coincidences) and upon individual electron groups separated by a differential discriminator. The variants of the decay scheme can be examined by comparing the intensity of the conversion lines in the coincidence spectrum. The results from measuring $\beta-e^-$ and e^-e^- coincidences are summarized in Fig. 1 and Fig. 2, those of $\gamma-e^-$ and $e^-\gamma$ coincidences in Fig. 4 and Fig. 5, discussed in detail for the individual

JA

Card 1/6 Z

SHPINEL', V.S. (Moskva)

The Mössbauer effect and its application. Izv. AN SSSR. Otd.
tekhn. nauk. Energ. i avtom. no.4:71-82 J1-Ag '62. (MIRA 15:8)
(Gamma rays) (Nuclear magnetic resonance and relaxation)

BRYUKHANOV, V.A.; DELYAGIN, N.N.; ZVENGLINSKIY, B.; SERGEYEV, S.A.; SHPINEL',
V.S.

Measuring spectra of gamma-ray quanta resonance absorption in
crystals. Prib.1 tekhn.eksp. 7 no.1:23-28 Ja-F '62. (MIRA 15:3)

1. Institut yadernay fiziki Moskovskogo gosudarstvennogo universiteta.
(Gamma-ray spectrometry)

KRYUKOVA, L. N.; MURAV'YEVA, V. V.; SHPINEL', V. S.; MALYSHEVA, T. V.;
KHOTIN, V. A.

Level scheme of Ir¹⁸⁹ excited by electron capture in Pt¹⁸⁹.
Izv. AN SSSR. Ser. fiz. 16 no.12:1492-1494 D '62.
(MIRA 16:1)

1. Nauchno-issledovatel'skiy institut yadernoy fiziki
Moskovskogo gosudarstvennogo universiteta im. M. V. Lomonosova
i Institut geokhimii i analiticheskoy khimii im. Vernadskogo
AN SSSR.

(Iridium—Isotopes) (Platinum—Isotopes)
(Electrons—Capture)

KRYUKOVA, L. N.; MURAV'YEVA, V. V.; FORAFONTOV, N. V.; SHPINEL', V. S.

Study of $e^- \gamma$ -coincidence in Pt¹⁸⁸ decay. Izv. AN SSSR. Ser.
fiz. 16 no.12:1521-1522 D '62. (MIRA 16:1)

1. Nauchno-issledovatel'skiy fizicheskiy institut Leningradskogo
gosudarstvennogo universiteta im. A. A. Zhdanova.

(Platinum--Decay) (Spectrometry)

S/048/62/026/002/016/032
B106/B108

AUTHORS: Strigachev, A. T., Sorokin, A. A., and Shpinel', V. S.

TITLE: Study of the terbium fraction

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya,
v. 26, no. 2, 1962, 252-258

TEXT: The terbium fraction, isolated radiochemically from a tantalum target after 660-Mev proton bombardment in the synchrocyclotron of the OIYaI was studied with a β -spectrometer БПП (BPP) (double-focusing) by the method of $\gamma\gamma$ -coincidences. The radiation source and the measuring device have been described before (Izv. AN SSSR. Ser. fiz., 25, no. 7, 813 (1961)). The spectrum of the conversion electrons of the Tb fraction was measured with a resolution of 1-2% in the range of 10-100 kev, and with 0.4% dissolution in the range of 530-3000 kev. (Tables 1, 2). The K and L lines of the γ -transition with 108.3 kev were used to graduate the spectrometer in the range of 10-100 kev. The spectrum of the Tb fraction was investigated up to conversion electron energies of ~ 3 Mev. Above 1 Mev, however, no conversion lines could be observed. The spectrometer

Card 1/6 3

Study of the terbium fraction

S/O48/62/026/002/016/032
B106/B108

state $f_{7/2}$ in a paper by N. M. Anton'yeva et al. (Izv. AN SSSR. Ser. fiz., 22, no. 2, 135 (1958)). Possibly the first excited level with 108.3 keV is of the $h_{9/2}$ type. This assumption does not contradict to the multipolarity $M1 + E2$ of the 108.3 keV γ -transition. The authors thank the team of the LYaP OIYaI under supervision of V. A. Khalkin for separating the Tb fraction, and K. Ya. Gromov and I. A. Yutlandov for assistance. There are 5 figures, 3 tables, and 10 references: 5 Soviet and 5 non-Soviet. The three most recent references to English-language publications read as follows: Toth K. S., Bjørnholm S., Jørgensen M. H., Nielsen O. B., Skilbreid O., Svanheden A., J. Inorg. and Nucl. Chem., 14, 1/2, 1 (1960); Toth K. S., Nielsen O. B., Skilbreid O., Nucl. Phys., 19, No. 4, 389 (1960); Toth K. S., Bjørnholm S., Jørgensen M. H., Nielsen O. B., Skilbreid O., Phys. Rev., 116, 1, 118 (1959).

ASSOCIATION: Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gos. universiteta im. M. V. Lomonosova (Scientific Research Institute of Nuclear Physics of Moscow State University imeni M. V. Lomonosov). Ob'yedinennyi institut yadernykh issledovaniy (Joint Institute of Nuclear Research)

Card 3/8 3

BRYUKHANOV, V.A.; GOL'DANSKIY, V.I.; DELYAGIN, N.N.; MAKAROV, Ye.F.;
SHPINEL', V.S.

Observation of the Mössbauer effect in a tin-containing polymer.
Zhur. eksp. i teor. fiz. 42 no.2:637-639 F '62. (MIRA 15:2)

1. Institut khimicheskoy fiziki AN SSSR i Institut yadernoy fiziki
Moskovskogo gosudarstvennogo universiteta.
(Polymers)(Gamma-ray spectrometry)

S/056/62/042/003/008/049
B104/B102AUTHORS: Fam Zuy Khuyen, Shapiro, V. G., Shpinel', V. S.TITLE: Resonance scattering of γ -quanta in Te^{125} PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42,
no. 3, 1962, 703 - 706

TEXT: The resonance of 35.5-keV γ -rays emitted from Te^{125m} was studied. Te^{125m} was obtained from neutron-bombarded metallic tellurium enriched in Te^{124} up to 86%. The TeO_2 obtained was used to produce sources of 20 mg/cm^2 thickness. A TeO_2 layer enriched in Te^{125} to 92% and applied onto an aluminum base served as scatterer. A luminescence spectrometer recorded the X-radiation from the scatterer. This radiation contained also resonance-scattered γ -quanta and the non-resonance-scattered radiation from the scatterer, the base, the shield, etc. The pulses from the photomultiplier (Fig. 2) were fed into two scaling circuits over an amplifier and a single-channel discriminator. One of these circuits

Card 1/3

Resonance scattering of...

S/056/62/042/003/008/049
B104/B102

Fig. 1. Te^{125m} decay scheme.

Fig. 2. Experimental arrangement.

Legend: (1) Source; (2) scatterer, in an NaI(Tl) detector crystal, (3); (4) lead collimator; (5) lead plate; (6) background filter; (7) black paper.

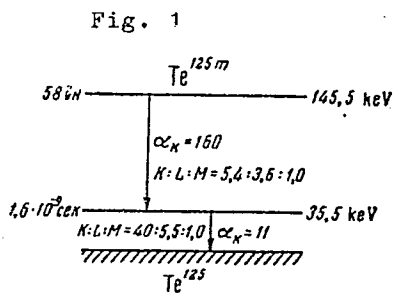
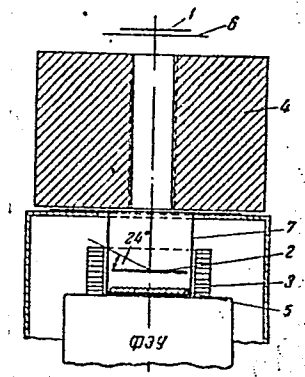


Fig. 2



Card 3/3

Magnetic moment of the...

S/056/62/042/005/007/050
B125/B108

$\mu_{\bar{H}} = 2.02 \pm 0.07$ mm/sec ($\mu_0 = -1.041$ of the nuclear magneton, μ_0 and μ denote the magnetic moments of the ground state and of the excited state of the Sn¹¹⁹ nucleus, respectively, H is the mean field strength). The isomeric shift of the absorption line in the alloy is $+1.36 \pm 0.04$ mm/sec. The magnetic field acting upon the tin nuclei in the alloy is 68 ± 2 koe. This internal magnetic field depends on the composition of the alloy. There are 1 figure and 1 table. The most important English-language reference is: O. C. Kistner, A. W. Sunyar, T. B. Swan. Phys. Rev., 123, 179, 1961. ✓

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

SUBMITTED: December 15, 1961

Card 2/2

Some characteristics of the spectra...

8/050/02/043/002/011/055
B102/B104

shift in tetravalent tin compounds increases from SnO_2 to SnI_4 with decreasing electro-negativity of the element (sequence: F, O, Cl, Br, S, I). (2) The isomer shift of the bivalent compounds is much larger than that of the tetravalent ones. (3) A quadrupole line splitting was only observed with the bivalent tin compounds. (4) The quadrupole interaction decreases with decreasing electro-negativity of the element connected with the tin. The following compounds were investigated: CaSnO_3 , SrSnO_3 , BaSnO_3 , SnO_2 , SnS_2 , SnO , $(\text{NH}_4)_2\text{SnCl}_6$, SnF_2 ; β -Sn, $\text{SnCl}_4 \cdot 5\text{H}_2\text{O}$, $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$, SnI_4 , SnBr_2 , and $\text{Sn}(\text{C}_6\text{H}_5)_4$. The gamma-quantum absorption probability ratios $f'(77^\circ\text{K})/f'(300^\circ\text{K})$ were as follows (same sequence): ~ 1 , ~ 1 , ~ 1 , 1.25, 2.6, 2.9, 5.7, 5.5, 6.0, 26, -, -, -, -. The interpretation of the results confirms the assumption that the Sn^{119} nuclear excitation raises the effective radius of the charge distribution (ZhETF, 41, 1767, 1961). There are 2 figures and 3 tables.

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

SUBMITTED: March 15, 1962
Card 2/2

S/048/62/026/012/008/016
B117/B186

AUTHORS: Kryukova, L. N.; Murav'yeva, V. V., Shpinel', V. S.,
Malysheva, T. V., and Khotin, V. A.

TITLE: Scheme of levels of Ir¹⁸⁹ excited on electron capture in Pt¹⁸⁹

PERIODICAL: Akademiya nauk SSSR.. Izvestiya. Seriya fizicheskaya, v. 26,
no. 12, 1962, 1492 - 1494

TEXT: The decay of the neutron-deficient isotope Pt¹⁸⁹, $T_{1/2} = 10.5$ hrs, was studied by analyzing the conversion spectrum of the platinum fraction. In the 30 - 650 keV range, the measurements were made with a magnetic spiral spectrometer using a method and experimental conditions described earlier (Izv. AN SSSR. Ser. fiz., 24, 1109 (1960); 25, 1257 (1961)). Besides the lines found previously, two new ones were discovered: 381 keV, $T_{1/2} =$ several hours, 645.1 and 644.5 keV, $T_{1/2} = 10 \pm 1$ hr, 6720.6. The energies of the γ -transitions in Ir¹⁸⁹ were measured and their multipole orders estimated (Tab. 2). Proceeding from the similarity of the odd isotopes Ir¹⁹¹ and Ir¹⁹³, a level scheme was proposed on the basis of the Card 1/4

Scheme of levels of...

S/048/62/026/012/008/016
B117/B.186

ASSOCIATION: Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gos. universiteta im. M. V. Lomonosova (Scientific Research Institute of Nuclear Physics of the Moscow State University imeni M. V. Lomonosov); Institut geokhimii i analiticheskoy khimii im. Vernadskogo Akademii nauk SSSR (Institute of Geochemistry and Analytical Chemistry imeni Vernadskiy of the Academy of Sciences USSR)

Fig. 1. Energy level diagram of Ir¹⁸⁹.

Table 2. Energy and multipole order of the γ -transitions in Ir¹⁸⁹.

Legend: (1) Possible values of the multipole orders; (2) small admixtures.

Card 3/4

e⁻γ-coincidences in ...

S/048/62/026/012/014/016
B117/B102

cascade between 140 and 280 kev. The analysis of coincidence and non-coincidence γ-spectra of Pt¹⁸⁸ served to determine relative intensities of the γ-lines. Comparison between the γ-intensities and the intensities of the conversion lines resulted in the following ratio of K-shell conversion coefficients: α_{K140}:α_{K187}:α_{K195}:α_{K280}:α_{L380}:α_{K410}:α_{K470} = 0.5:1:1:(≤0.1):(≤0.05):(≤0.03):(≤0.05). This paper was presented at the 12th Annual Conference on Nuclear Spectroscopy in Leningrad from January 26 to February 2, 1962. There are 2 figures and 1 table.

ASSOCIATION: Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gos. universiteta im. M. V. Lomonosova (Scientific Research Institute of Nuclear Physics of the Moscow State University imeni M. V. Lomonosov)

Card 2/2

BRYUKHANOV, V.A.; DELYAGIN, N.N.; SHPINEL', V.S.

Magnetic moment of the excited state of the Sn^{119} nucleus at an energy of 23.8 Kev. Zhur. eksp. i teor. fiz. 42 no.5: 1183-1185 My '62. (MIRA 15:9)

1. Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.

(Tin—Magnetic properties) (Quantum theory)

SPINEL, V.S.

3/05C/62/04/002/01/033
3102/3104

2

AUTHORS: Bryukhanov, V. A., Gol'danskiy, V. I., Delyagin, N. N.,
Korytko, E. A., Makarov, Ye. P., Suzdalev, I. P., Shchegolev, A. A.

TITLE: Peculiarities of Mossbauer spectra of organo-tin compounds
and the role of the nearest chemical bonds in the Mossbauer
effect

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43,
no. 2(8), 1962, 443-452

✓

NOTE: In continuation of their studies on the Mossbauer effect in
organo-tin compounds (ZhEF, 42, 637, 1962), the authors determined
a Mossbauer effect in the resonance absorption of 23.8-kev gamma-quanta by
Sn¹¹⁹ nuclei. Many examples, e.g. Sn(C₆H₅)₄, SnCl₄ on the one hand, and
Sn(C₆H₅)₂Cl_{2-i} (i=1,2,3) on the other, show that in compounds with four
identical substituted groups the Mossbauer lines appear as the usual
singlet, whereas with different substituted groups (R_iCnX_{4-i}) a distinct
doublet occurs. The two lines differ in width and intensity, depending
Card 1/2

Peculiarities of Mossbauer spectra...

S/055/62/0.3/002/015/053
3102/3104

on the ratio of R to X. In amorphous media, e.g. in stanniferous glass, the Mossbauer effect was observed for the first time. The glass composition was the following: SnO_2 -9.1%; SiO_2 -61.3%; B_2O_3 -18.5%; Al_2O_3 -5.2%; Na_2O -7.9%. The spectra of crystalline $\text{Sn}(\text{C}_6\text{H}_5)_4$ and its solid solution in polymethylmethacrylate and of crystalline $\text{Sn}(\text{C}_2\text{H}_5)_2\text{Cl}_2$ and of its 20% solution in dichloroethane are identical. Some of the data obtained indicate that the decisive factor determining the shape of the Mossbauer spectra (isomer shift and quadrupole splitting) are the molecular bonds closest to the tin nucleus. There are 5 figures and 1 table.

ASSOCIATION: Institut Khimicheskoy fiziki Akademii nauk SSSR (Institute of Chemical Physics of the Academy of Sciences USSR)

SUBMITTED: April 12, 1962

Card 2/2

S/056/62/043/003/009/063
B125/B102AUTHORS: Alekseyevskiy, N. Ye., Fam Zuy Kiyen, Shapiro, V. G.,
Shpinel', V. S.TITLE: Anisotropy of the Mössbauer effect in a β -Sn single crystalPERIODICAL: Zhurnal experimental'noy i teoreticheskoy fiziki, v. 43,
no. 3(9), 1962, 790 - 794

TEXT: The resonance absorption probability f of 23.8 keV γ -quanta in white tin was studied at 77°K and 293°K. The lamellar absorbers, about 57.5 mg/cm² thick, were cut out from β -Sn single crystals in the (001), (101) and (100) planes. The trial measurements were made with a polycrystalline tin foil. The γ -quantum sources, consisting of Sn^{119m} nuclei in SnO₂ (88% Sn¹¹⁸; ~5 mg/cm² thick), were irradiated in a reactor. In all experiments the source was kept at room temperature. The figure shows three spectra taken at 77°K under identical geometrical conditions. Probably because of quadrupole interaction, the half-widths of the lines observed are greater than the theoretical half-widths if allowance is

Card 1/3

Anisotropy of the Mössbauer...

S/056/62/043/003/009/063
B125/B102

made for the effective thicknesses of absorber and source. The gradient of the electric field in β -Sn crystals is axisymmetrical in first approximation, the axis of symmetry being perpendicular to the (001) plane. The components of the absorption spectrum for the (001), (101) and (100) planes have the relative intensities $a = 3$, $a = 9/7$ and $a = 3/5$, $a = \frac{w_{+3/2}}{w_{+1/2}}$; $w_{+3/2} \sim (1 + \cos^2 \theta)$, $w_{+1/2} \sim ((5/3) - \cos^2 \theta)$. w_{+J_2} is the resonance absorption probability of the γ -quanta to the corresponding sublevel. θ is the angle between the symmetry axis of the crystal and the direction of the incident γ -quantum. The greater the quadrupole splitting and the smaller the effective absorber thickness, the greater the shift of the absorption maximum towards the more intense component and the asymmetry of the line. The resonance absorption probabilities at 77°K are $f'_{100} : f'_{001} : f'_{\text{polycryst}} = 1 : 0.67 : 0.89$, at 293°K, $f'_{100} : f'_{101} : f'_{001} : f'_{\text{poly}} = 1 : 0.95 : 0.75 : 0.80$. There are 1 figure and 3 tables.

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

Card 2/3

3/056/62/043/004/018/061
B102/B180AUTHORS: Aleksandrov, A. Yu., Delyagin, N. N., Mitrofanov, K. P.,
Polak, L. S., Shpinel', V. S.TITLE: quadrupole interaction and isomeric shifts of 23.8-kev gamma
transition of Sn¹¹⁹ nucleus in organo-tin compoundsPERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43,
no. 4(10), 1962, 1242 - 1247

TEXT: In continuation of earlier studies (ZhETF, 42, 637, 1962; 43, 448, 1962) on the Mossbauer resonance absorption spectra of 23.8-kev γ -quanta by Sn¹¹⁹, this work deals with the effect of substituting certain atomic groups in organic compounds of the $(C_4H_9)_2SnX_n$ type, and SnX₄ by others on the isomeric shift δ , and the quadrupole interaction; X is an element or a group of atoms, n = 1, 2. The resonance absorption spectra were recorded with a) an absorber whose velocity was varied linearly with time and b) one of constant velocity, the thicknesses varying from 30 - 100 mg/cm². The latter method yielded more accurate spectra since the device used had

Card 1/12

Quadrupole interaction ...

S/056/62/043/004/018/061
B102/B180

selective sensitivity to 23.8-keV γ -quanta. 5 mg/cm² SnO₂ containing Sn^{119m} was used as a γ -quantum source. The organo-tin compounds investigated had no impurities which affected the shape of the spectrum. In all measurements the source was kept at room temperature and the absorber at liquid-nitrogen temperature. The values obtained for δ and for the quadrupole splitting constant Δ vary regularly for the compounds for which the electronegativity of the X atoms varies. Double bonds, and also atoms with high electronegativity not directly bonded with the tin atoms, were found to exert a strong effect on the electric field strength acting on the tin nucleus. This can be qualitatively explained by the molecular structure. There are 3 figures and 1 table. ✓

ASSOCIATION: Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (Institute of Nuclear Physics of Moscow State University). Institut neftekhimicheskogo sinteza Akademii Nauk SSSR (Institute of Petrochemical Synthesis of the Academy of Sciences USSR)

SUBMITTED: May 18, 1962
Card 2/12

S/056/62/043/006/016/067
B102/B104

AUTHORS: Sorokin, A. A., Shtal', M. Z., Shpinel', V. S.

TITLE: The Zr⁹⁷ decay scheme

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43,
no. 6(12), 1962, 2056-2062

TEXT: It has been found previously (Ref. 1. Izv. AN SSSR, seriya fiz., 20, 913, 1956) that in the Zr⁹⁷ decay, besides the 745-keV isomeric state (T_{1/2} = 60 sec) of Nb⁹⁷, several higher levels are excited with intensities ≤ 10% (cf. Ref. 2. Nucl. Phys., 1, 499, 1956). The values obtained in Refs 1 and 2 for transitions excited in the Zr⁹⁷ decay coincide, those excited in the Nb⁹⁷ decay do not agree but energy and intensity of the γ-lines agree with each other. In order to explain these facts, the Zr⁹⁷ decay was studied in detail. The spectra of the γ-lines and of the γγ coincidences arising in the decay Zr⁹⁷ → Nb⁹⁷ → Mo⁹⁷ were measured with a coincidence
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✓

S/056/62/043/006/016/067
B102/B104The Zr⁹⁷ decay scheme

scintillation spectrometer and a NaI(Tl)-crystal spectrometer with $\phi\gamma$ -24 (FEU-24) photomultiplier and a AM-100 (AI-100) 100-channel pulse-height analyzer. The γ -lines 1.12 Mev (Zn⁶⁵) 2.62 Mev (Te²⁰⁸) and 2.76 Mev (Na²⁴) served as standards. The above-mentioned higher levels were found to be at 1.15, 1.35, 1.75, 1.84, and 2.1 Mev. The suggested Zr⁹⁷-Nb⁹⁷ decay scheme is shown in Fig. 5. Its characteristics are discussed in detail. The characteristics of the 1.15 and 1.35 Mev levels could not be determined. The absence of transitions from them to the 0.745-Mev level indicates spins of above 3/2. The decay scheme suggested eliminates the contradictions that arose between Ref. 1 and Ref. 2. There are 5 figures and 1 table.

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

SUBMITTED: July 18, 1962

Card 2/3

S/056/62/043/006/018/067
B102/B104

AUTHORS: Aleksandrov, A. Yu., Delyagin, N. N., Mitrofanov, K. P.,
Polak, L. S., Shpinel', V. S.

TITLE: Influence of gamma irradiation on the shape of Mössbauer
resonance absorption spectra of organo-tin compounds

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43,
no. 6(12), 1962, 2074 - 2076

TEXT: The spectra of Mössbauer resonance absorption of 23.8-keV gamma
quanta by Sn¹¹⁹ in organo-tin compounds depends on the valency of the ab-
sorbing atom, on the molecular structure and on peculiarities of the bonds
of the tin atom (ZhETF, 43, 448, 1962; 43, 1242, 1962). This dependence
could be used to draw conclusions on irradiation-induced changes of a
material from changes in the Mössbauer resonance absorption characteristics.
In order to study these possibilities, the Mössbauer resonance absorption
spectra of (C₄H₉)₂SnSO₄ (I) and [(C₄H₉)₂Sn(OCOCCH₂CH₂)₂]_n, irradiated at
25-35°C by Co⁶⁰ γ-rays with doses between 4·10²⁰ and 3·10²² ev/cm³ were
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S/056/62/043/006/018/067
B102/B104

Influence of gamma ...

investigated. The spectrum of non-irradiated I shows a symmetric doublet, the peaks corresponding to the velocities -0.6 and $+4.2$ mm/sec. Irradiation with maximum dose led to a distinct change in the spectrum: two lines with an intensity ratio 1:3 arose, corresponding to the velocities -0.3 mm/sec and 4 mm/sec. indicating a disintegration of I into C_4H_9 and $SnSO_4$. In a few cases only one oxygen atom was split off from I. On irradiating I in the presence of oxygen only one line appeared, its peak corresponding to zero velocity. This spectrum is interpreted as due to the presence of SnO_2 or a similar oxide formed in oxidation by O_3 produced on irradiation. The spectrum of the polymer irradiated with a dose of 11.2 Mr shows two lines of almost equal width and intensity at -0.15 and 2.85 mm/sec. When the dose is increased to 160 Mr both lines broaden, the latter doing so more rapidly but reducing its height at the same time. When the dose has reached 250 Mr, the line at -0.15 mm/sec has remained almost unchanged (width 1.5 mm/sec) but the 2.85 -mm/sec line shows a splitting into several flat poorly resolved components. This asymmetry can be explained by assuming an intramolecular magnetic field whose energy of

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Influence of gamma ...

S/056/62/043/006/018/067
B102/B104

interaction with the Sn¹¹⁹ nucleus is weaker than that of quadrupole interaction. It cannot be attributed to any certain chemical structure. There is 1 figure.

ASSOCIATION: Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (Institute of Nuclear Physics of Moscow State University); Institut neftekhimicheskogo sinteza Akademii nauk SSSR (Institute of Petrochemical Synthesis of the Academy of Sciences USSR) ✓

SUBMITTED: July 20, 1962

Card 3/3

L 10384-63 EWT(m)/BDS--AFPTC/ASD--AR
ACCESSION NR: AP3002718

S/0120/63/000/003/0049/0054 55

AUTHOR: Mitrofanov, K. P.; Illarionova, N. V.; Shpinel', V. S. 54

TITLE: Counter with selective efficiency for registering recoilless Gamma radiation 19

SOURCE: Pribory i tekhnika eksperimenta, no. 3, 1963, 49-54

TOPIC TAGS: Gamma radiation, Gamma radiation counter, resonant absorption, internal conversion electrons, Mossbauer effect

ABSTRACT: A radiation detector¹⁹ with selective response to recoilless Gamma radiation is described. Its operating principle is based on registering the internal conversion electrons which emerge as a result of Gamma radiation and which have a mean free path comparable to that of the latter. This is the case for compounds of tin such as SnO sub 2, for which the probability of resonant absorption of Gamma rays is high. A working model of such a "resonant" counter

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L 10384-63
ACCESSION NR: AP3002718

contained two flat plexiglass disks covered with 0.01-mm copper foil and a surface layer of SnO sub 2 enriched to 75% with the isotope Sn sup 119. The disks were 40 mm in diameter and spaced 5 mm apart; in this intervening space three tungsten wires were located, to which various combinations of voltage were applied. Test curves from two counter configurations are shown: in one, the source was moved with some velocity with respect to the counter, and in the second, the source and counter were stationary but an intermediate absorber element was caused to move. Results show the increased sensitivity of the resonant method over the usual scintillation counter; e.g., the former's insensitivity to x-rays obviates the need for a lead shield, giving a resultant increase in Gamma-ray sensitivity of 30--50%. Orig. art. has: 6 formulas and 6 figures.

ASSOCIATION: Nauchno-issledovatel'skiy institut yadernoy fiziki MGU (Scientific Research Institute of Nuclear Physics MGU)

SUBMITTED: 31Mar62 DATE ACQ: 12Jul63 ENCL: 00

SUB CODE: 00 NO REF SOV: 003 OTHER: 003

Card 2/2 ph/ps

GROMOV, K.Ya.; DANAGULYAN, A.S.; STRIGACHEV, A.T.; SHPINEL', V.S.

Isomeric state of Nd¹³⁹. Izv. AN SSSR. Ser. fiz. 27 no.10;
1357-1359 0 '63. (MIRA 16:10)

S/056/63/044/002/001/065
B102/B186

AUTHORS: Pam Zui Khuen, Shpinel', V. S.

TITLE: Dependence of the γ -quantum resonance-absorption spectrum on lattice temperature

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 44, no. 2, 1963, 393-397

TEXT: The authors investigated the resonance-absorption spectra of 23.8-keV γ -quanta from Sn^{119} in polycrystalline SnO_2 powder at different temperatures in the range 78-645°K. The source (thickness 8 mg/cm²) was always kept at 78°K and only the absorber temperature was altered, as was its thickness. In all cases the spectrum consisted of a single non-split peak, whose half-width Γ_{obs} ($\Gamma_{\text{obs}} > \Gamma_{\text{true}}$) was measured in relation to the absorber thickness d at 78, 293, 495, and 645°K. The straight lines obtained were extrapolated to zero thicknesses, thus yielding the value of Γ_{extr} . The line $\Gamma_{\text{true}}(d)$ calculated for room temperature intersects with

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Dependence of the γ -quantum ...

S/056/63/044/002/001/065
B102/B186

the extrapolated measured lines for 78 and 293°K at zero thickness. The maximum absorption $\epsilon_0 = [N(\infty) - N(0)]/N(\infty)$ was also measured as a function of d at room temperature. From these measurements the absorption probability f' (without recoil) was determined. First, the case is considered that line broadening is caused by the doublet structure of emission and absorption lines with the distances Δ_S and Δ_A between their components. These distances were calculated from integrating Γ_{extr} . Also the dependence of ϵ_0 on the effective absorber thickness $C_A = n\sigma_0 f'$ was calculated for various Δ_A . This curve calculated for $\Delta_A = 3.2$ coincides with the experimental one for $f' = 0.50$ and $\alpha f = 0.42$; αf denotes the fraction of the total counting rate which is due to γ -quantum emission without recoil. The values of f' obtained by this method are denoted by f'_I . When splitting is taken into account, the $\epsilon_0(d)$ curve obtained does not correspond with the measured one. Then the case is considered of emission and absorption lines being broadened, their Lorentz shape however, being retained. The Lorentz widths are $\Gamma_S, \Gamma_A > \Gamma_{\text{true}}$. In this case the

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Dependence of the γ -quantum ...

S/056/63/044/002/001/065
B102/B166

results (f''_{II} and $\beta_A = \Gamma_A / \Gamma_{true}$) closely with the experiments. The line shift with temperature, observed at $T \lesssim 300^\circ K$, is weakly nonlinear; at $T \gtrsim 300^\circ K$ it is linear. This shift is attributed to a second-order Doppler effect. Results:

T, °K	Γ_{extr} , mm/sec	Δ_A	f'_I	f''_{II}	β_A
78	1,29	3,2	0,62	0,70	2,1
293	1,30	3,3	0,50	0,56	2,1
495	1,43	4,1	0,42	0,50	2,5
645	1,53	4,5	0,35	0,43	2,8

There are 3 figures and 1 table.

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

SUBMITTED: June 8, 1962 (initially), October 1, 1962 (after revision)

Card 3/3

L-13643-63 FCS(f)/EWP(q)/EWT(m)/BDS AFPTC/ASD JD

ACCESSION NR: AF3003117

S/0056/63/044/006/1889/1895

AUTHOR: Fam Zui Khiyen; Shpinel', V. S.; Viskov, A. S.; Venevtsev, Yu. N.

TITLE: Resonance absorption of Gamma quanta in barium, strontium, and calcium stannates

SOURCE: Zhurnal eksper. i teor. fiziki, v. 44, no. 6, 1963, 1889-1895

TOPIC TAGS: resonance absorption of photons, recoilles absorption, barium stannate, strontium stannate, calcium stannate, dielectric properties

ABSTRACT: The parameters of resonance absorption of the 23.8-keV Gamma quanta emitted by Sn sup 119* were measured over the temperature range from 78 to 1020 °K for the stannates of barium, strontium, and calcium, which all have a perovskite structure. This is a continuation of a similar investigation made on tin oxide (ZhETF v. 44, 393, 1963), and is aimed at checking the possible difference in the distribution of internal fields in the stannates and in the perovskite ferro- and antiferroelectrics, for which purpose study of the gamma-ray resonance absorption properties yields independent information on the field gradients and position of the tin ions. The temperature dependences of the probability for recoilless absorption and of the position of the resonance were

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L 13643-63

ACCESSION NR: AP3003117

studied. All compounds displayed a similar characteristic variation of the width with the temperature. The temperature variation of the unit cell size of barium and strontium stannate was studied in the temperature intervals 293 - 893 and 293 - 843 °K, respectively. The effects of atomic-mass and parameter differences of the unit cell on the measured quantities are discussed, as well as a possible mechanism for the change in the width and shape of the absorption spectrum, with the nonmonotonic variation of the width with temperature being attributable to a definite relation between the nondiagonal and diagonal elements of the dynamic quadrupole interaction. "The authors express their gratitude to Prof. G. S. Zhdanov and to G. A. Bykov, for participating in the formulation of the problem and for a discussion of the results, and to V. N. Lyubimov for interest in the work. Orig. art. has: 5 figures and 1 formula.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University); Fizikokhimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute)

SUBMITTED: 27Feb63

DATE ACQ: 23Jul63

ENCL: 00

SUB CODE: 00

NO REF SOV: 015

OTHER: 006

Card 2/2

L 13847-63 FGS(f)/BDS JXT(IJP)

ACCESSION NR: AP3003156

8/0056/63/044/006/2182/2183

55
53

AUTHOR: Fam'Zul Khaiyen; Viskov, A. S.; Shpinel', V. S.; Venevtsev, Yu. N.

TITLE: Abrupt change in probability of the Mossbauer effect at the phase transition in ferroelectrics

SOURCE: Zhurnal eksper. i teor. fiziki, v. 44, no. 6, 1963, 2182-2183

TOPIC TAGS: Mossbauer effect, phase transitions in ferroelectrics, first order transition, resonance gamma-ray absorption, anomalous changes

ABSTRACT: An attempt was made to detect anomalous changes of the parameters for resonance gamma-ray absorption (such as probability of recoilless resonance absorption or shift of resonance energy) accompanying a ferroelectric phase transition in the series of solid solutions of bismuth ferrite in strontium stannate. The Sn sup 119* contained in tin oxide was used as a source. An abrupt change in the probability for recoilless resonance absorption(f') was observed and was attributed to the transition of the solid solution from the paraelectric to the ferroelectric state; this was confirmed by x-ray photographs. The widths of the transition regions reach sizeable values and increase with the strontium stannate content. The phenomenon is explained from the thermodynamic point of view as being due to a discontinuous decrease in the part of the internal
Card 1/2

L 13847-63

ACCESSION NR: AP3003156

2

energy associated with the thermal motion of the lattice. Orig. art. has: 2 figures and 1 formula.

ASSOCIATION: Institut yadernoy fiziki Moskovskogo gosudarstvennogo univertiteta, Fiziko-khimicheskiy institut im. L. Ya. Karpova (Institute of Nuclear Physics of Moscow State University Physicochemical Institute)

SUBMITTED: 28May63

DATE ACQ: 23Jul63

ENCL: 00

SUB CODE: 00

NO REF SOV: 004

OTHER: 000

Card 2/2

S/020/63/148/001/027/032
B101/B186

AUTHORS: Aleksandrov, A. Yu., Delyagin, N.N., Mitrofanov, K.P.,
Polak, L.S., Shpinel', V.S.

TITLE: Investigation of organo-tin compounds by Mössbauer resonance
absorption of gamma quanta

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 148, no. 1, 1963, 126-128

TEXT: The 23.8 keV gamma absorption spectra by Sn^{119} nuclei were investigated for 22 organo-tin compounds. $\text{Sn}^{119}\text{mO}_2$ was used as gamma source, and the absorbers were cooled to nitrogen temperature. The isomeric shift δ and the amount Δ of the quadrupole splitting were measured. Results: (1) In the compounds SnR_4 , where $\text{R} = \text{C}_2\text{H}_5, \text{C}_6\text{H}_5, \text{C}_3\text{H}_7, \text{C}_4\text{H}_9, \text{or } \text{CH}_2\text{CH}_2\text{CN}$, δ was ~ 1.3 mm/sec, corresponding to the electron density caused by 4 Sn-C bonds on the Sn nucleus. The atoms not bound to Sn had no effect on δ . (2) In the compounds $(\text{C}_4\text{H}_9)_2(\text{C}_{n-2n+1}\text{COO})_2$, $n = 1, 7, \text{ or } 17$, δ was 1.45 ± 0.10 mm/sec, and Δ was 3.45 ± 0.20 mm/sec. n

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Investigation of organo-tin compounds ...

S/020/63/148/001/027/032
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had no effect on the electron distribution in the Sn-O bond. (3) The highly electronegative chlorine affected δ , even if it was not bound to Sn. Data found for $(C_4H_9)_2Sn(CH_2ClCOO)_2$: $\delta = 1.60 \pm 0.10$, $\Delta = 3.65 \pm 0.10$, and for $(C_4H_9)_2Sn(CCl_3COOH)_2$: $\delta = 1.65 \pm 0.10$, $\Delta = 3.80 \pm 0.10$. (4) For $F_3Sn(CH_2CH_2CN)_3$ and $(C_2H_5)_3SnOH$, the doublet formed by quadrupole interaction was found to be asymmetric. It is assumed that the quadrupole interaction is accompanied by a magnetic interaction affected by m . If an internal magnetic field exists in the molecule perpendicularly to the electric field the component of the quadrupole splitting is affected by whether the transition occurs from the $m = \pm 3/2$ or from the $m = \pm 1/2$ sublevel. There are 1 figure and 1 table. ✓

ASSOCIATION: Institut neftekhimicheskogo sinteza Akademii nauk SSSR (Institute of Petrochemical Synthesis of the Academy of Sciences USSR); Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta im. M.V. Lomonosova (Institute of Nuclear Physics of the Moscow State University imeni M.V. Lomonosov)

Card 2/3