YEVSTIGNEYEV, V.B.

20-5-41/60

AUTHOR YEVSTIGNEYEV, V.B. and GAVRILOVA, V.A.

TITLE On the Nature of the Primary Photoreduced Form of Chlorophyll and its Analogues.
(O prirode pervichnoy fotovosstanovlennoy formy khlorofilla i yego analogov.- Russian)

PERIODICAL Doklady Akademii Nauk SSSR 1957, Vol 114, Nr 5, pp 1066-1069 (U.S.S.R.)

ABSTRACT In laboratory work (see "A:" below) it was shown that on illumination of solutions of chlorophyll and its analogues which contain a reducing substance the potential of an inert metal electrode shifts in negative direction when immerged in the solution. This is connected with the occurrence in the solution of a labile, electrode-active, primary reduced form of pigment. In the case of the pheophytins, in which this form proved to be more stable than in others of the pigments investigated the absorption spectrum of this form could successfully be recorded at low temperature. It possesses a flat absorption maximum within the range of 470-500 μm. It was demonstrated that the sensitivation reactions of the series of oxidizing-reducing reactions through chlorophyll or its analogues pass a

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stage of formation of the primary reduced form. It is ionized. The nature of this form and its relationship with the secondary reduced red form of the same pigments has not been fully explained. In order to obtain experimental material on this problem a number of experiments with application of spectral and electrometric methods was performed. Fig.1 shows the alterations of potential of the platinum electrode in a solution of chlorophyll and pheophytin in pyridine on illumination of the solution in vacuum. In both cases the potential rises again after an initial decrease. Within a few minutes it attains a level of equilibrium which is determined by the content of the primary reduced form. In switching off the ligth the potential decrease to the initial level or farther. The explanation has to be sought in the further alteration of the primary form or in its conversion to the secondary one which possesses no electrode-activity, or in the decrease in activity of the primary form itself as a consequence of e.g. interaction with the solvent or reducing agent. Both factors may exert influence here. The conclusion on the change of the primary form, as shown in fig.2, is correct. The position of the minimum of the curve depends on

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chlorophyll concentration. As it is impossible to cite all test results here, the authors only point out that the electrometric measurements under different conditions agree with the above-mentioned assumptions. The absence of electrode-activity in the secondary reduced form is directly confirmed by tests in vacuum by pouring phaeophytine solution to the electrode. Fig.3 shows the test results on the influence of low temperatures (-100°) on the formation speed of the primary photoreduced form of phaeophytine. The speed of the reduction progress stays the same at -100, -60 and 20°C. Further the speed of the inverse reaction was examined at the same temperatures and in darkness. In the case of phaeophytine at -20°C the inverse reaction proceeds so slowly that the course of the curve cannot be influenced during the short duration of the test. Therefore the reaction speed is fully determined by the speed of the direct reaction. This evidently proves that the formation of the primarily photoreduced form

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represents a mere photochemical procedure - transition of an electron from the donor (reduction substance) to the pigment molecule activated by light. The primary form is very capable of reaction, electrode-active, possesses a high reducing potential and a molecule charge. All this indicated that it is probably a compound of the type of an ionized free radical - the semiquinone. The red photo-reduced form apparently is a further alteration product of the primary form by addition of a proton. Whether this takes place directly by addition of the ionized semiquinone or by dismutation is still uncertain.
(3 fig., 11 Slavic references)

ASSOCIATION: "An.N. BAKH" Institute for biochemistry of the Academy of Sciences of the USSR.
(Institut biokhomii im.A.N. Bakha Akademii nauk SSSR)

PRESENTED BY: AnN. TERENIN, member of the Academy.

SUBMITTED: 20.12.56

AVAILABLE: Library of Congress.

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YEVSTIGNEYEV, V.B.

20-3-30/59

AUTHORS Yevstigneyev, V.B., Gavrilova, V.A.

TITLE The Nature of the Primary Light Reduced Form of Chlorophyll and its Analogues, as Investigated by the Use of D_2O. (Issledovaniye prirody pervichnoy fotovosstanovlennoy formy khlorofilla i yego analogov s primeneniyem D_2O.-Russian)

PERIODICAL Doklady Akademii Nauk SSSR, 1957, Vol 115, Nr 3, pp 530-533 (U.S.S.R.)

ABSTRACT The data given in former reports prove that the primary light reduced form of chlorophyll and its analogues discovered by the author which are the first light reduced stage of these pigments are according to their nature a free radical, i.e. an ionized semiquinone. It is formed by electron transfer from the reducing substance to the long-lived excited biradical pigment form. The question whether the formation of the primary reduced form is really only the result of the electron transfer to the pigment or whether a proton is also taking part here, can, however, not be considered as definitely solved. By simplifying the system the following 2 reaction series can be realized on the occasion of the light reduction of clorophyll and its analogues. They contain the formation of the primary reduction product with properties which were discovered in former investigations.

$$Chl^{\vee} + RH_2 \longrightarrow \underline{Chl}^- + RH_2 \longrightarrow \underline{ChlH} + .RH,$$

$$Chl^{\vee} + RH_2 \longrightarrow \underline{Chl}^- + RH^+ \longrightarrow ChlH_2 + R.$$

Chl = chlorophyll in the biradical state, RH_2 = the reducing substance, and $\underline{Chl}$ = the primary and secondary forms. For the purpose of a de-

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finite solution of the question as to which series of these reactions has to be preferred in every case with reference to the formation of the primary reduced form, the authors decided to use the well-known kinetic method which is based upon the substitution of the unstable hydrogen (H) by deuterium(D). Illustration I shows the influence of the substitution of H by D in ascorbic acid on the velocity of formation of the primary and secondary reduced pheophytin -a- forms. The mentioned substitution does not slow down this reaction, on the contrary, it slightly accelerates the reaction. In contrast to that the substitution of H_2O by D_2O slows down the velocity of the appearance of the red reduced form to a great extent. The transition of the primary reduced pheophytin product was proved by the direct experiment (fig.2). Thus the results of the use of D_2O are absolutely against participation of the proton in the formation of the primary reduced form, in contrast to the formation of the secondary reduced form. The latter is formed by the primary photo-chemical electron transfer from the reducing substance to the pigment which is in the long-lived excited state. The electron connection obviously takes part at an arbitrary place of the system of conjugated bindings which considerably changes the absorption spectrum of the pigment and makes it indistinct. The secondary reduced form is obviously a result of a further proton connection. The absorp-

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tion spectrum becomes more discrete though it differs from the spectrum of the initial pigment. The use of D_2O permitted the repeated confirmation that the red-violet reduced compound which develops on the occasion of the light reduction of phtalcyanine. Inspite of its instability represents the secondary reduced form, since its velocity of formation, especially that of the regressive reaction, decreases in the case of the substitution of H by D in the reducting substance. There are 3 illustrations and 8 Slavic references.

ASSOCIATION Institute for Biochemistry "A.N.Bakh" of the A.N. of the U.S.S.R. (Institut biokhimii im.A.N.Bakha Akademii Nauk SSSR)

PRESENTED By Terenin, A.N. Member of the Academy, March 2, 1957
SUBMITTED February 22, 1957
AVAILABLE Library of Congress.

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YEVSTIGNEYEV, V. B. Moscow (USSR)

"The Role of Primary, Photo-Reduced Form of Chlorophyl in the Photosensibilization of Redox-Reactions."

report submitted IV Intl. Cong. of Biochemistry, Vienna, 1-6 Sep 1958.

YEVSTIGNEYEV, V.B., GAVRILOVA, V.A., RYBALKA, N.D.

Changes in the oxidation-reduction potential of leaf homogenates ("green suspension") induced by light [with summary in English]. Biokhimiia 23 no.6:824-834 N-D '58 (MIRA 11:12)

1. Institut biokhimii imeni A.N. Bakha AN SSSR, Moskva.
(PLANTS, EFFECT OF LIGHT ON)
(OXIDATION-REDUCTION REACTION)
(CHLOROPHYLL)

76-32-5-1/47

AUTHOR: Yevstigneyev, V. B.

TITLE: The Mechanism of the Photoreduction of Chlorophyll and Its Sensitizing Effect (Mekhanizm fotovosstanovleniya khlorofilla i yego sensibiliziruyushchego deystviya)

PERIODICAL: Zhurnal fizicheskoy khimii, 1958, Vol. 32, Nr 5, pp. 969-980 (USSR)

ABSTRACT: The investigations by A. A. Krasnovskiy based on a work by K. A. Timiryazev (Ref 4), and carried out at the Laboratory of Photochemistry under the direction of A. N. Terenin, Member, Academy of Sciences, USSR, showed that chlorophyll in solution can be reversibly photoreduced by ascorbic acid and other dienol compounds; on this occasion a relatively stable reduced red form of this pigment is formed which has a higher reduction potential and in the dark reconverts into its initial form especially on the addition of an oxidizing agent. In further works by A. A. Krasnovskiy a similar reaction was observed in the case of compounds of an analogous structure of the chlorophyll, as, however, the investigation results are incomplete, the present work carried out with the collaboration by V. A. Gavrilova is devoted to the clarification of the reaction mechanism as well as to the investigation

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of perhaps occurring intermediate products. The spectrophotometric investigations carried out showed that the photochemical velocity of reduction of chlorophylls and pheophytines in pyridin with ascorbic acid, and in toluene with phenylhydrazine increases steadily with the concentration of the reducing agent, which fact points at a dependence on the probability of collision of the reaction molecules. A temperature drop to -40° effected a practical standstill of the formation reaction of the red modification, while an exchange of hydrogen by deuterium in the reducing agent showed that the formation of the red reduced form of chlorophyll as well as of pheophytine is no pure photochemical reaction but a stage of the proton transfer in the dark. Continuing the works by Timiryazev (Ref 4) it was found that the reduction process in the dark with zinc and the photochemical one in the light lead to the same products. Corresponding to the experimental results of the potentiometric experiments it is assumed that a primary form of the photoreduction develops before the formation of the red modification and that it produced a remarkable reaction on the electrode, this intermediate product having been more stable with analogues containing no magnesium than

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with magnesium containing ones; it was also found that its formation can be especially well observed at low temperatures. On heating, this form converts partly to chlorophyll and partly to the red reduction form, while an addition of hydrogen acceptors also in the case of low temperatures causes a re-formation of the initial pigment, which fact distinguishes this form from the secondary reduction form, just as well as the observation that in the case of a hydrogen-deuterium exchange no change takes place, and that there is proof that hydrogen does not take part in the formation reaction. Conductometric measurements showed that this primary reduction form is an ionized one and that it has a charge which fact also distinguishes it from the secondary form and leads to the assumption that it is a free radical of the type of an ionized semiquinone. A scheme of the reversible photoreduction of chlorophyll and its analogues is given as well as explanations concerning the mechanism of the photosensibilization of chlorophyll in redox reactions in solutions serving as experimental basis for investigations of the effect in the living leaf, and where the electrochemical methods used for the first time

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can also be applied successfully in investigations of photochemical reactions of other dyes. Finally the author thanks A. N. Terenin, Member, Academy of Sciences, USSR, and Professor A. A. Krasnovskiy for their interest in this work. There are 9 figures and 29 references, 28 of which are Soviet.

ASSOCIATION: Akademiya nauk SSSR, Institut biokhimii im. A. N. Bakha (Institute of Biochemistry imeni A. N. Bakh, AS USSR)

SUBMITTED: February 3, 1958

1. Chlorophylls--Photochemical reactions 2. Chlorophylls--Photosensitivity 3. Chlorophylls--Test results 4. Spectrographic analysis

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AUTHORS: Yevstigneyev, V. B., Gavrilova, V. A. 20-118-6-27/43

TITLE: On the Original Reduced Form of Some Compounds Related to Chlorophyll
(O pervichnoy vosstanovlennoy forme nekotorykh rodstvennykh khlorofillu soyedineniy)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol. 118, Nr 6, pp. 1146-1149 (USSR).

ABSTRACT: The photochemical reduction of chlorophyll and pheophytin taking place in 2 stages was proved in previous elaborate investigations by the authors (references 1a to 3). The first stage leads to the original reduced form of the pigment. It has the properties of a free radical, viz. of semiquinone. This is achieved by the photochemical transfer of an electron from the reducer to the pigment. Protopheophytin, bacteriopheophytin and haematoporphyrin which are capable of reversible reduction at room-temperature, were investigated in this report (references 3,4). The authors selected magnesiumfree compounds for spectro= graphical investigations, because they hoped the reduced forms would be more stable (references 2,1 v). The previously described

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method (reference 1,2) was applied for the determination of the unstable reduced form, viz. spectrophotometry at low temperatures. A more complete spectrum of absorption of the original reduced pheophytin-form a, than given in reference 1 v, is given in figure 1. A comparison of these two spectra is given. The yellow-greenish initial coloring changes rapidly to a red coloring b y the illumination of an evacuated protopheophytin-solution containing ascorbic acid in pyridine, at - 40°C. The product of the reduction has a rather characteristic spectrum of absorption (figure 2) with a small maximum at 640 mμ, two maxima within the range of 550 - 555 and 520 mμ, a pronounced maximum at 460 mμ and a flat maximum at 400 mμ. The product is apparently rather stable under anaerobic conditions at - 40°C. When air is let in, and the product is shaken, the spectrum returns instantly to the initial state, but it preserves reversibility very well. It reacts as quickly with safranine, riboflavin and several other dyes. The photoreduced solution becomes greenish-yellow by heating up to room-temperature. It is seen from the spectrum that the red product passes over partly into the initial pigment (figure 2). From these properties it may be concluded that

the red product represents a previously unknown form of protopheophytin. Bacteriopheophytin was (very) rapidly reduced at low temperature and led usually to yellow, relatively stable products of a deep-going reduction of apparently partly destructive character. An unstable intermediate product was observed more clearly when phenylhydrazine was used as reducer. The spectrum could be plotted only approximately. A maximum of absorption at 640 m μ exists there. In the darkness it passes already at low temperature partly over into the initial pigment, partly into the secondary yellowish reduced product without visible maxima. Also the existence of the unstable original reduced form of haematoporphyrine was proved. Due to a white illumination of the pyridin-solution in the presence of ascorbic acid, the pink coloring changed rapidly into orange-yellow at -40°C. The maxima of the initial pigment decreasing due to the photoreduction- and the increasing absorption within the range of about 460 m μ are given in figure 3. An illumination lasting more than 30 seconds had no further effect since a state of equilibrium was apparently attained. The admission of air or the addition of other electron-acceptors shows the same effect as with pheophytin. Also heating shows the

same effects. It may be assumed that the unstable product is semiquinone. The conception that the electron-connection takes place initially at the place of the main system of the conjugated compounds and that it destroys this system (reference 3), is confirmed by the results of this elaborate investigation. The lacking or the presence of metal in the center of the molecule is of great importance for the kinetics of reduction. The replacement of hydrogen by magnesium increases the instability of the initial reduced form of pigment and consequently the capability of the initial pigment for rapid cyclic oxidational reductive conversions.

There are 3 figures, and 5 references, 4 of which are Slavic.

ASSOCIATION: Institute for Biochemistry imeni A.N. Bakh, AS USSR (Institut biokhimii im. A. N. Bakha Akademii nauk SSSR)

PRESENTED: November 4, 1957, by A. N. Terenin, Academician.

SUBMITTED: November 1, 1957.

AUTHORS: Yevstigneyev, V. B., Gavrilova, V. A. 20-119-1-34/52

TITLE: An Investigation of Some Problems Concerning the Mechanism of Sensitization of Redox Reactions by Chlorophyll and Its Analogues With the Use of D_2O (Issledovaniye nekotorykh voprosov mekhanizma sensibilizatsii okislitel'no-vosstanovitel'nykh reaktsiy khlorofillom i yego analogami, s primeneniyem D_2O)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol. 119, Nr 1, pp. 125-128 (USSR)

ABSTRACT: In papers (references 1-4, 8b) it was proved that the sensitization mentioned in the title in solutions includes a stage of the formation of a labile pre-reduced form of the sensitizer-pigment which is followed by a reaction of this form with an oxidizer. According to the existing data (references 3,4) an original (primary) photoreduced form which according to its nature is an ionized semiquinone (references 5,6) serves as this reduced intermediate product. A high reactivity of this latter form makes assume that the secondary protonic-form (references 1,4) of the pigment does on this occasion not find time for formation - in any case

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not in quantities which can play a part worth mentioning. A simple scheme of the possible 5 partial chemical reactions in the above-mentioned sensitization is given. The oxidized reducer can form by the series of reactions 1,2,3, or 1,4,5. This reaction mainly takes place according to reactions 1,2,3. When reactions 4 and 5 play a part at all, then it is a minor one. In view of the fundamental importance of the mechanism under review the authors wanted to obtain additional experimental material on it. In this paper they investigate the influence of the substitution of the labile hydrogen in the reducer by deuterium upon the velocity of the photoreduction of the azo dye in pyridine which was sensitized by chlorophyll or its analogues. As was proved earlier (ref. 7) such a substitution of H by D does not act upon the formation velocity of the primary photoreduced pigment form. But the formation of the reduced proton-form (references 7,8) is strongly slowed down (twice or more). It could therefore be hoped that the use of D_2O would help to obtain valuable material with regard to the mechanism of sensitization. a + b- and a, b- chlorophyll-solutions, a-pheophytine- and

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magnesium-phthalocyanate in pyridine (about 10^{-5} Mol/liter) were used. Ascorbic acid and hydrochloric phenylhydrazine (10^{-2} - 10^{-3} Mol/liter) were used as reducer. Methyl red was used as hydrogen-electron-acceptor. The velocities of the sensitized reduction of the acceptor under illumination (with the exclusion of oxygen) by light that is only absorbed by the sensitizer-dye (light filter Rg-5) were compared, where 10% H_2O ot D_2O was added to pyridine. Figure 1 shows the result of an experiment in diagram form. The difference of the reaction velocity in the presence of H_2O and D_2O was small. The chief material is given in table 1. No dependence of the experimental results on the change of the quantity of the reducer (ascorbic acid or phenylhydrazine) or on the intensity and time of illumination could hitherto be determined. From the figures of the last line of table 1 clearly follows that such a retardation of the reaction which takes place in the case of a substitution of H by D in the reducer during the formation reaction of the secondary reduced form (40-50%) (references 7,8) does not take place

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in this case. Either the velocity of the sensitized reaction is only slightly slowed down or even markedly accelerated. Thereby it is confirmed that the formation of the reduced protonic-form of the sensitizer does not represent an obligatory stage of the sensitized reduction. Therefore the sensitization actually predominantly, if not exclusively, takes place by the formation of the primary, reduced electronic form of the sensitizer with an immediate reaction of this form with the acceptor-oxidizer. The addition of a proton and the formation of the leuco form of the reducible dye apparently takes place on the way of further reactions of the primary (electronic) reduced form (of the ionized semiquinone) of the acceptor (reaction 3). Similar investigations with acetone-solutions of dyes fully confirmed the above-given results.

There are 1 figure, 1 table, and 10 references, 9 of which are Soviet.

ASSOCIATION: Institut biokhimii im. A. N. Bakha Akademii nauk SSSR (Institute for Bicchemistry imeni A. N. Bakh AS USSR)

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An Investigation of Some Problems Concerning the Mechanism of Sensitization of Redox Reactions by Chlorophyll and Its Analogues With the Use of D_2O 20-119-1-34/52

PRESENTED: November 4, 1957, by A. N. Terenin, Member, Academy of Sciences, USSR

SUBMITTED: November 1, 1957

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YEVSTIGNEYEV, V. B.

EVSTIGNEEV, V.B.

"On the Mechanism of Photoreduction and Sensitizing Action of Chlorophyll."
Paper submitted for the Int'l Botanical Congress, Montreal, Canada, 19-29 Aug 1959.

A.N.Bakh Inst. of Biochemistry, Academy of Sciences U.S.S.R., Moscow.

YEVSTIGNEYEV, F.B.

Nature of elementary photoreactions of chlorophyll [with summary in English]. Biofizika 4 no.1:124-218 Ja '59. (MIRA 12:1)

1. Institut biokhimii im. A.N. Bakha AN SSSR, Moskva.
(CHLOROPHYLL,
basic photoreactions (Rus))

YEVSTIGNEYEV, V.B.; SAVKINA, I.G.

Dark and photochemical reduction of protochlorophyll. Biofizika, 4 no.3:289-299 '59. (MIRA 12:7)

1. Institut biokhimii im. A.N. Bakha AN SSSR, Moskva.
(CHLOROPHYLL,
protochlorophyll, dark & photochem. restoration (Rus))

YEVSTIGNEYEV, V.B.; GAVRILOVA, V.A.

The ability of chlorophyll to photosensitize oxidation-reducation reactions under heterogeneous conditions. Biofizika 4 no. 6:641-649 '59. (MIRA 14:4)

1. Institut biokhimii AN SSSR imeni A.N. Bakha, Moskva.
(CHLOROPHYLL) (OXIDATION-REDUCTION REACTION)
(PHOTOSYNTHESIS)

SOV/48-23-1-15/36

24(7)

AUTHOR: Yevstigneyev, V. B.

TITLE: On the "Activation" of the Fluorescence of Chlorophyll and Its Analogues (Ob "aktivatsii" fluorestsentsii khlorofilla i yego analogov)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959, Vol 23, Nr 1, pp 74 - 77 (USSR)

ABSTRACT: In the present paper the author discusses the discoveries made at the Laboratory of Photobiochemistry of the Institut biokhimii im. A. N. Bakha Akademii nauk SSSR (Institute of Biochemistry imeni A. N. Bakh of the Academy of Sciences, USSR) under the supervision of A. N. Terenin as well as those made by Livingston (Ref 3) and his collaborators (US) on their own part. These detections refer to the properties of chlorophyll in such a polar solvents as benzene, toluene, CCl_4 and other substances, the change of fluorescence intensity with simultaneous change of the absorption as dependant on the absence or presence of minute quantities of a polar compound in the solution. In the preceding paper (Ref 2) the author detected a similar phenomenon in the

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synthetic compound magnesium phthalocyanine in toluene. The fluorescence intensity of chlorophyll in purest toluene, for instance, is greatly increased already by a small addition of water that flows over it in the form of humid air (activation by polar solvents) (Figs 1,2). According to observations made in this field and additional data on the influence of temperature (Fig 3) the author arrived at the following conclusions: In apolar solvents, the chlorophyll molecules and their analogues with Mg represent non-fluorescent dimers. The whole phenomenon is lacking in the analogues of chlorophyll without magnesium since the bond of two molecules is produced by way of the magnesium atom. By adding a polar solvent, the dimers are split into monomers due to affiliation of the polar compound to the pigment. The author emphasizes the fact that luminescence is present only with molecularly distributed chlorophyll molecules and can be produced only in that molecular distribution into which the aggregates of the molecule are transferred by the "activators", i.e. polar compounds. There are 3 figures and 6 references, 3 of which are Soviet.

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SOV/20-124-3-57/67

17(3)

AUTHORS: Yevstigneyev, V. B., Gavrilova, V. A., Savkina, I. G.

TITLE: On the Photoreduction of Bilirubin and Protoporphyrin in Connection With the Study of the Photoreduction of Chlorophyll (O fotovosstanovlenii bilirubina i protoporfirina v svyazi s izucheniyem fotovosstanovleniya khlorofilla)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 3, pp 691-694 (USSR)

ABSTRACT: The chemical mechanism of the reaction, mentioned in the title, of chlorophyll and its analogues (discovered and studied at the laboratoriya fotobiokhimii = Laboratory of Photo-Biochemistry of the Institute mentioned in the Association) (Refs 1,2) so far remains unclarified. The authors quote the findings hitherto made with regard to this problem (Refs 1-10). For the purpose of obtaining further data, bilirubin (Ref 12) was tested with regard to its photoreductibility. Bilirubin contains the same 4 pyrrole rings, connected by methine bridges, as the porphyrins, the bond chain, however, remaining open. Therefore, there is a bilirubin absorption maximum in organic solvents in the short wave range of the spectrum, at about 450 mμ. Solutions of reactive bilirubin in pyridine and alcohol were investigated. They contained ascorbic acid or phenyl hydrazine. In vacuum tubes, the evacuated solutions were illuminated

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through a light filter BS-8 which cuts off the ultraviolet spectrum range below 370 mμ, and subjected to spectrophotometry. The tests showed that the bilirubin maximum decreased only slowly and irreversibly, whereas the absorption maxima of chlorophyll and other porphyrin pigments (with or without magnesium in the molecule center) changed significantly and reversibly (Refs 1,2). The counter-reaction did not occur on the addition of air. These findings were confirmed by the electrometrical measuring method of the redox potentials of photoreducible solutions. The test results with bilirubin directly substantiate the assumption that a closed system of conjugate double bonds plays the most important role in the photoreduction of pigments. The results of the tests with the photoreduction of protoporphyrin, as carried out by the authors, also point to this fact (see diagram; Ref 12). Figure 1 shows the changes of the absorption spectrum of an evacuated protoporphyrin solution in pyridine that contains ascorbic acid. They occurred with illumination and with the counter-reaction of the reduced product at room temperature and at -40°. From the analogy with the primary processes that take place in the photoreduction of the pheophytins

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On the Photoreduction of Bilirubin and Protoporphyrin in Connection With the Study of the Photoreduction of Chlorophyll

a and b, of proto-pheophytin, and hematoporphyrin (Refs 2,3), the authors assume that the now formed, highly unstable reduced product (absorbed in the 470-475 mμ range) constitutes the primary photo-reduced form of protoporphyrin, i.e. a free radical of the type of an ionized semiquinone (Ref 4). Although the lateral substituting groups are not of fundamental importance for the photoreductibility of the pigment, they may nevertheless affect the kinetics of partial reactions, and consequently the result of the reaction in general (Refs 2,3). The capacity of protoporphyrin to form the primary electrode-active form is confirmed by electrometrical measurings of the redox potentials (Fig 2). The above results prove the fact that the photoreduction of protoporphyrin - which does not contain a cyclopentanone ring - yet occurs on the same pattern as in the case of chlorophyll. These results re-confirmed the fact that this very ring system of conjugate double bonds is the localizing point of the photochemical reduction process of the pigment. The absorbed light quanta by acting upon the π-electrons of the system of said bonds, induce the system (due, apparently, to a conversion into a biradical, Ref 16) into a state in which it is capable of receiving a surplus electron. The localizing of the latter (if it occurs at all)

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On the Photoreduction of Bilirubin and Protoporphyrin in Connection With the Study of the Photoreduction of Chlorophyll

still remains unknown. In conclusion approaches of the solution of this problem are indicated.- There are 1 figure and 16 references, 13 of which are Soviet.

ASSOCIATION: Institut biokhimii im. A. N. Bakha Akademii nauk SSSR (Institute of Biochemistry imeni A. N. Bakh of the Academy of Sciences, USSR)

PRESENTED: September 17, 1958, by A. N. Terenin, Academician

SUBMITTED: September 15, 1958

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17(3)

AUTHORS: Yevstigneyev, V. B., Gavrilova, V. A. SOV/20-126-2-51/64

TITLE: Photosensitization of Redox Reactions by Chlorophyll Under Heterogeneous Conditions (Fotosensibilizatsiya okislitel'no-vosstanovitel'nykh reaktsiy khlorofillom v geterogennykh usloviyakh)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 2, pp 410-413 (USSR)

ABSTRACT: There are facts which indicate the ability of chlorophyll mentioned in the title; however, they do not prove it directly (Refs 8,9). Above all such a proof is missing for the aggregated state at an apparently existing separation macro-surface: pigment-medium. The latter system is the subject of the present paper. The medium was an aqueous one: both a) the electron source and b) the electron receiver were solved. In case a) ascorbic acid and in case b) azo dyes were used: methyl red, acidic blue and acidic orange, which supply irreversible reproduction products. As heterogeneous sensitizing systems suspensions of chlorophyll, phcophytin and magnesium phthalocyanine were used. There were difficulties in obtaining suspensions of the two former pigments which were overcome by recording absorption curves without dye. The photoreaction took place in vacuum vessels (Ref 10) while boiling the solution. Table 1 shows the sensitizing effect of the pigments in experiments

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carried out by filtering off the pigment particles. A comparison of the absorption quantity in the maxima of the dyes after illumination and after a storing without illumination undoubtedly indicates a photosensitizing effect of the pigment suspension. Further the authors found out that the course of the sensitized reaction can also be followed up without filtering off the pigment. For this reason the extinction of the mixture has to be measured 20 - 30 seconds after shaking (Table 2, Fig 1). The sensitizing effect of the pigment is due to the surmounting of the activation energy of the reaction between the two respective components. The rate of the sensitizing reaction increases at illumination with light which is absorbed by the pigment only (Fig 2A), and also in the case of density increase of the sensitizer suspension (Fig a B) within certain limits. The concentration of the reducing substance exercises a strong effect at low concentrations and vice versa. The sensitizing reaction takes place better in an acid medium. The presence or absence of air in heterogeneous systems in an aqueous medium is without great importance for the reaction rate. In conclusion various hypotheses are expressed concerning the photosensitizing mechanism and papers are discussed (Refs 4, 5, 9 - 18). The

Photosensitization of Redox Reactions by Chlorophyll Under Heterogeneous Conditions SOV/20-126-2-51/64

simplified mechanism described is by all means possible in the case of chloroplast granuli. There are 2 figures, 2 tables, and 18 references, 15 of which are Soviet.

ASSOCIATION: Institut biokhimii im. A. N. Bakha Akademii nauk SSSR (Institute for Biochemistry imeni A. N. Bakh of the Academy of Sciences, USSR)

PRESENTED: January 19, 1959 by A. N. Terenin, Academician

SUBMITTED: December 25, 1958

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17(3)

AUTHORS: Yevstigneyev, V. B., Gavrilova, V. A. SOV/20-127-1-55/65

TITLE: An Investigation of the Mechanism of Photosensibilization of Oxidation-reduction Reactions by Chlorophyll in Solutions by Measuring Their Electroconductivity (Izucheniye mekhanizma fotosensibilizatsii okislitel'no-vosstanovitel'nykh reaktsiy khlorofillom v rastvorakh putem izmereniya elektroprovodnosti)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 127, Nr 1, pp 198-201 (USSR)

ABSTRACT: A scheme is given initially according to which, in all probability, the sensibilization mentioned in the title proceeds. (Refs 1, 2). $Chl^{\overline{\cdot}}$ is a primary reduced form of pigment, that is a free radical of the semiquinone type (Ref 3) which is produced by the electron addition to the pigment molecule activated by light. One of the symptoms of the occurrence of $Chl^{\overline{\cdot}}$ in the solution (under certain conditions, especially in pyridine in the presence of phenyl hydrazine) is the change of the electroconductivity of the solution when it is illuminated (Ref 4). The character of this change and the reduction of the electroconductivity when the light is switched off differs with

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various dyes, and is determined by the experimental conditions and the properties of the primary form reduced by light as well as by the products of the transformation of other reaction components. Figure 1 shows a typical picture which results from a quick succession of light and darkness in an evacuated chlorophyll-a-solution in pyridine (containing phenyl hydrazine). Proceeding from this mechanism it can be expected that the equilibrium-quantity of Chl^- in the presence of an electron acceptor capable of a quick interaction with Chl^-, will be much smaller during illumination. This ought to influence the change of the electroconductivity (Refs 1, 5). It is to be expected especially in the case of the chlorophyll a that the introduction of the chlorophyll will considerably reduce and even stop the changes shown in figure 1. Such an effect would prove the correctness of the said mechanism. The influence of the presence of some dyes the reduction by light of which can be sensibilized by chlorophyll a on the changes of the electroconductivity was investigated: methyl red (Ref 6), safranin T (Refs 6, 7), azide blue (Ref 8) and finally carotene (Refs 9, 10, 12, 16). Table 1 shows quite obviously that the

An Investigation of the Mechanism of Photosensibilization of Oxidation-reduction Reactions by Chlorophyll in Solutions by Measuring Their Electroconductivity SOV/20-127-1-55/65

said electroconductivity changes cease completely in the presence of the acceptor, but begin again according to the reduction by light of the acceptor. Figure 2 shows the results of experiments with safranin. Its introduction into the solution increases the electroconductivity rapidly. This is the consequence of the ionization of the dye in pyridine. Fluctuations of these changes take place, but stop after several illumination periods. Thus the participation of the ionized form reduced by light of pigment in the sensibilization i.e. the correctness of the initially mentioned scheme was proved. In pheophytin a similar phenomenon is observed, but its picture is not so clear. Table 2 shows the influence of carotene. There are 2 figures, 2 tables, and 16 references, 11 of which are Soviet.

ASSOCIATION: Institut biokhimii im. A. N. Bakha Akademii nauk SSSR (Institute of Biochemistry imeni A. N. Bakh of the Academy of Sciences, USSR)

PRESENTED: March 16, 1959, by A. N. Terenin, Academician

SUBMITTED: March 14, 1959

Card 3/3

YEVSTIGNEYEV, V. B. USSR Academy of Sciences, Moscow.

"Mechanism of Reversible Photoreduction of Porphyrins."

paper submitted for the Third Intl. Congress on Photobiology, Copenhagen, 31 July - 5 August 1960.

YEVSTIGNEYEV, V.B.; GARILOVA, V.A.

The ability of adsorbed chlorophyll to photosensitize oxidation-reduction reactions. Biofizika 5 no. 5:599-608 '60.
(MIRA 13:10)

1. Institut biokhimii imeni A.N. Bakha AN SSSR, Moskva.
(CHLOROPHYLL) (OXIDATION-REDUCTION REACTION)

YEVSIIGNEYEV, V. B.

USSR

[redacted], Ye. A. Dr. - "Chloroplast Enzymes Participating in CO_2 Fixation" (Session C)

DOMAN, N. A., Dr., Institute of Biochemistry, imeni A. N. BAKH, USSR Academy of Sciences - "Primary Products of CO_2 Assimilation in Photosynthesis" (Session D)

KAVETSKIY, V. B., Dr. - "Photosensibilization of Chlorophyll Under Heterogeneous Conditions" (Session B)

KVASNOVSKIY, A. A., Institute of Biochemistry, imeni A. N. BAKH, USSR Academy of Sciences - "The Nature of Chlorophyll Under Heterogeneous Conditions" (Session B)

MICHIPONOVICH, A. A., Dr., Institute of Plant Physiology, imeni K. A. TIMIRYAZEV, USSR Academy of Sciences - "Ways of Carbon and Nitrogen in Photosynthesis" (Session D)

SAPOZHNIKOV, D. I., Institute of Botany, imeni V. L. KOMAROV, USSR Academy of Sciences - "Participation of Carotenoids in Reactions of Photosynthesis" (Session C)

ZALENSKIY, O. V., Dr., Institute of Botany, imeni V. L. KOMAROV, USSR Academy of Sciences - "Relation between Photosynthesis and Respiration" (Session D)

Report to be presented at the 5th Int'l Congress of Biochemistry, Moscow, USSR, 1-16 Aug 61.

YEVSTIGNEYEV, V. B., GAVRILOVA, V. A., SAVKINA, I. G. (USSR)

"Examination of the Photoreduction and Photosensitizing Ability of Chlorophyll by Measurement of Electroconductivity."

Report presented at the 5th International Biochemistry Congress, Moscow, 10-16 August 1961

YEVSTIGNEYEV, V. B. (USSR)

"The Ability of Chlorophyll to Photosensitize Oxidation-Reduction Reactions in Heterogeneous Conditions."

Report presented at the 5th International Biochemistry Congress, Moscow, 10-16 August 1961

SOKOLOVSKIY, Abram Levkovich; YEVSTIGNEYEV, V.B., doktor tekhn. nauk, spets. red.; MURASHEVA, O.I., red.; SOKOLOVA, I.A., tekhn. red.

[Physicochemical foundations of the caramel industry] Fiziko-khimicheskie osnovy proizvodstva karameli. Izd. 2., perer. i dop. Moskva, Pishchepromizdat, 1961. 131 p. (MIRA 14:7)
(Caramel)

YEVSTIGNEYEV, V.B.; SAVKINA, I.G.

Studying photoreduction of chlorophyll and its analogues in various solvents by measuring its electric conductivity. Biofizika 6 no. 1:30-39 '61. (MIRA 14:2)

1. Institut biokhimii im. A.N. Bakha AN SSSR, Moskva.
(CHLOROPHYLL) (OXIDATION-REDUCTION REACTION)
(PHOTOCHEMISTRY) (ELECTRIC CONDUCTIVITY)

YEVSTIGNEYEV, V.B.; GAVRILOVA, V.A.

Ability of an artificial lipoprotein complex of chlorophyll to sensitize oxidation-reduction reactions. Biofizika 6 no.5:563-571 '61. (MIRA 15:3)

1. Institut biokhimii imeni A.B. Bakha AN SSSR, Moskva.
(CHLOROPHYLL) (LIPOPROTEINS)
(OXIDATION-REDUCTION REACTION)

SAVKINA, I.G.; YEVSTIGNEYEV, V.B.

Comparing the photosensitizing activity of chlorophylls a and b in solution. Dokl.AN SSSR 138 no.4:958-961 Je '61. (MIRA 14:5)

1. Institut biokhimii imeni A.N.Bakha AN SSSR. Predstavleno akademikom A.N.Tereninym.

(CHLOROPHYLL)

30712

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S/020/61/141/002/026/027
B101/B110

AUTHORS: Yevstigneyev, V. B., and Gavrilova, V. A.

TITLE: Comparison of reduction potentials of chlorophyll and bacterial pigments exposed to light

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 141, no. 2, 1961, 477-480

TEXT: For comparison of the reduction potentials of chlorophyll (Cp) obtained from nettle by chromatographic separation, of the bacteriochlorophyll (Bcp) of Rhobopseudomonas palustris and of the bacterioviridine (Bv) of Chlorobium lamicula, mixtures of the pigments were exposed to the light of the absorption maximum of Cp and the absorption maximum of the bacterial pigment. The bacterial pigments were prepared by Ye. V. Pakshina, a collaborator in the authors' laboratory. The following mixtures were examined: chlorophyll a + b and bacteriochlorophyll (I); chlorophyll a and bacteriochlorophyll (II); chlorophyll b and bacteriochlorophyll (III); bacteriochlorophyll and bacterioviridine (IV); chlorophyll a and bacterioviridine (V). The examination was carried out in vacuum tubes by means of a Beckmann DU spectrophotometer or an

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S/020/61/141/002/026/027

Comparison of reduction potentials of ... B101/B110

СФ-4 (SF-4) spectrophotometer. The band absorbed by Bcp was obtained by means of a light-filter combination (5mm) from СЗС-11 (SZS-11)+КС-19 (KS-19) which did not permit penetration of <700 mμ light. The band absorbed by Cp was exposed by means of a filter combination from СЗС-3 (SZS-3)+ЖС-4 (ZhS-4) which allowed penetration of the 410-590 mμ band, maximum ~480-470 mμ. Experiments with mixture I (approx. 10^{-5} mole/liter) dissolved in methanol with approx. 10^{-1} mole/liter of phenyl hydrazine as a reducing agent showed the following: On exposure to light (770mμ) absorbed by Bcp the intensity of the absorption maximum continually decreased, while the intensity of the Cp (660 mμ) absorption band remained unchanged. Exposure to blue light (430 mμ) resulted in quick reduction of light absorption by Bcp, while the absorption maximum of Cp at 660 mμ remained almost unchanged. During a control test with Bcp and the reducing agent solely, the intensity of the 770 mμ band did not change on exposure to blue light. The same result was obtained for I dissolved in pyridine, ascorbic acid being used as reducing agent, as well as for mixtures II and III. Sensitized reduction of Bcp occurred in each case. The reduction potential of Cp is, therefore, higher than that of Bcp. Under the same conditions pheophytin a and b and protochlorophyll were also effective.

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No sensitized reduction of Bcp occurred in mixture IV after exposure to blue light. The reduction potential of the primary reduced form of Bv (Chlorobium-chlorophyll) is, therefore, smaller than that of the corresponding form of Cp. A different process was chosen for mixture V because both pigments have equal absorption spectra and, consequently, separation of light by means of light filters was not possible. 1) The reduction of Cp and Bv was separately examined (dissolved in pyridine, ascorbic acid as a reducing agent). This resulted in a slower reduction of Bv (Fig. 2). 2) The concentration of Cp was a) doubled; b) the same amount of Bv was added. As shown by curves 3 and 4, the addition of Bv inhibited the reduction of Cp. Curve 4 may be interpreted as an acceleration of the reduction of Bv due to the presence of Bv. Therefore, in all the experiments Cp formed active reduced compounds having higher reduction potentials than the corresponding forms of bacteriopigments. Vegetable and bacterial pigments can therefore be distinguished already in the molecular state and not only in the living organism. This contradicts the assumption of the same primary photochemical phase (photolysis of H_2O) in bacteria and plants. There are 2 figures and 12 references: 9 Soviet and 3 non-Soviet. The two references to English-

30712

S/020/61/141/002/026/027
B101/B110

Comparison of reduction potentials of ...

language publications read as follows: A. A. Krasnovskiy, Ann. Rev. Plant Physiol., 11, 363 (1960); C. Van Niel, Photosynthesis in Plants, 1949, p. 437.

ASSOCIATION: Institut biokhimii im. A. N. Bakha Akademii nauk SSSR (Institute of Biochemistry imeni A. N. Bakh of the Academy of Sciences USSR)

PRESENTED: June 24, 1961, by A. N. Terenin, Academician

SUBMITTED: June 12, 1961

Fig. 2. Course of photoreduction in pyridine containing approx. 2.10^{-2} mole/liter of ascorbic acid. Legend: (1) Bacterioviridine (initial $K_{670} \simeq 0.5$); (2) chlorophyll a ($K_{670} \sim 0.5$); (3) chlorophyll a ($K_{670} \sim 1.0$); (4) mixture of bacterioviridine

Card 4/4

YEVSTIGNEYEV, V. B.

"On the Mechanism of Photosensitization of Oxidation-Reduction Reactions by Chlorophyll and Related Compounds in Heterogeneous Conditions."

report presented at the Intl. Colloquium on Photosynthesis, Gif-Sur-Yvette, France, 23-27 July 1962.

Inst. of Biochemistry im. A. N. Bakh, Acad. Sci. USSR

SEREBROVSKAYA, K.B.; YEVSTIGNEYEV, V.B.; GAVRILOVA, V.A.; OPARIN, A.I.

Photosensitizing activity of chlorophyll in coacervates. Biofizika 7 no.1:34-41 '62. (MIRA 15:5)

1. Institut biokhimii imeni A.N.Bakha AN SSSR, Moskva.
(CHLOROPHYLL) (COACERVATES)

YEVSTIGNEYEV, V.B.; SAVKINA, I.G.; GAVRILOVA, V.A.

Photoelectrochemical properties of chlorophyll and phthalocyanine films on polarized electrodes. Biofizika 7 no.3:298-305 '62. (MIRA 15:8)

1. Institut biokhimii imeni A.N.Bakha AN SSSR, Moskva.
(CHLOROPHYLL) (PHTHALOCYANINE) (ELECTROCHEMISTRY) (PHOTOCHEMISTRY)

YEVSTIGNEYEV, V.B.; SAVKINA, I.G.

Mechanism of the photosensibilizing action of chlorophyll and phthalocyanine under heterogeneous conditions. Biofizika 8 no.2:181-190 '63. (MIRA 17:10)

1. Institut biokhimii im. A.N. Bakha AN SSSR, Moskva.

[illegible] which chlorophyll propert as are often studied. In this work water-soluble [illegible] water-

APPROVED FOR RELEASE: 09/17/2001 CIA-RDP86-00513R001963020004-6"

YEVSTIGNEYEV, V.B.

Mechanism of the photosensitizing effect of chlorophyll in vitro. Biofizika 8 no.6:664-676 '63. (MIRA 17:7)

1. Institut biokhimii imeni A.N. Bakha, AN SSSR, Moskva.

L 9871-63 BDS S/0048/63/027/006/0782/0786

AUTHOR: [illegible]

[illegible] absorption and fluorescence spectra of water-soluble analogs of [illegible]

approach to [illegible] The present study is part of a series of systematic investigations of the products of alkaline hydrolysis of chlorophyll: chlorophyllides and chlorophyllins. The present paper gives the results of measurements of the absorption and fluorescence spectra of the products of alkaline hydrolysis of chlorophyll a and [illegible] and prepared from a sample distilled from sucrose. [illegible]

Card 1/2

[illegible]

spectra were recorded [illegible]

Orig. art. has: 5 figures.

ASSOCIATION: Institut biokhimii imeni A. N. Bakha Akademii nauk SSSR (Biochemistry Institute, Academy of Sciences, SSSR)

SUBMITTED: DATE ACQ: ENCL:

SUB CODE: NO REF SOV: OTHER:

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Card 2/2

KOMISSAROV, G.G.; GAVRILOVA, V.A.; NEKRASOV, L.I.; KOBOZEV, N.I.; YEVSTIGNEYEV, V.B.

Photosensitizing activity of chlorophyll adsorbed on capron as related to the surface concentration. Dokl. AN SSSR 150 no.1:174-175 My '63. (MIRA 16:6)

1. Moskovskiy gosudarstvennyy universitet im. M.V.Lomonosova i Institut biokhimii im. A.N.Bakha AN SSSR. Predstavleno akademikom A.N.Tereninym.

(Chlorophyll) (Nylon) (Photosynthesis)

YEVSTIGNEYEV, V.B.; GAVRILOVA, V.A.; SAVKINA, I.G.

Mechanism of the photosensitizing effect of chlorophyll. Dokl. AN SSSR 151 no.1:227-230 Jl '63. (MIRA 16:9)

1. Institut biokhimii im. A.N.Bakha AN SSSR. Predstavleno akademikom A.N.Tereninym.

(Chlorophyll--Spectra)

YEVSTIGNEYEV, V. B.

"On the mechanism of photosensitizing action of chlorophyll."

report submitted for 10th Intl Botanical Cong, Edinburgh, Scotland, 3-12 Aug 64.

ACCESSION NR: AP4042474 S/0217/64/009/004/0414/0422

AUTHOR: Mel'nikov, S. S.; Tevstigneyev, V. B.

TITLE: Separation and spectral properties of chlorophyll c

SOURCE: Biofizika, v. 9, no. 4, 1964, 414-422

TOPIC TAGS: photosynthesis, photosynthetic pigment, tetrapyrrol pigment, chlorophyll, chlorophyll a, chlorophyll c, chlorophyll absorption spectra, chlorophyll luminescence spectra, algae chlorophyll, algae pigment

ABSTRACT: This article is a report of the first Soviet attempt to obtain and chromatographically purify chlorophyll c from algae. A method for obtaining this compound in large quantities from dry algae was developed at the Institute of Biochemistry, AN SSSR, and the Laboratory Biophysics and Isotopes, AN BSSR. There were no differences between the pigment obtained from dried algae and that obtained from fresh plants. If dried brown algae (Fucus and Cystaseira) were used, all the pigments present in the plant mass were extracted with acetone containing aqueous ammonia; from this extract

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ACCESSION NR: AP4042474

chlorophyll a and part of the carotenoids were removed by extraction with petroleum ether; the residual pigments were paper chromatographed from the condensed ethyl ether solution; the main difficulty consisted in separation of chlorophyll c and pheopherbide a, since the pigments contain no phytol and have similar chromatographic properties. The best separation was achieved by using a mixture of gasoline (bp 95—105C), petroleum ether (bp 40—60C), and isopropanol in the ratio of 5:1:1/2. The chlorophyll c content in Cystoseira is 3.5 times higher than in Fucus, constituting 0.4 mg of pigment in 1 g dry weight of algae. A slightly modified method had to be used for the diatomic algae Phaeodactylum tricornutum because of splitting of chlorophyll a by chlorophyllase in the cells. The final separation from pheophorbide was completed as above. Repeated chromatographic purification produced practically pure chlorophyll c. The pigment is insoluble in organic nonpolar solvents and soluble in polar solvents. Its solution in acetone is emerald green with a scarlet fluorescence. It forms a copper-red sediment 85% ethanol, in which hexagonal crystals were observed. The pigment is rather stable. The absorption and luminescence spectra of the pigment and its pheophytin were obtained. The pigment is capable of association, which is important in connection with its state in live algae. The significance

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ACCESSION NR: AP4042474

of the study of the pigment is stressed by the fact that approximately 80% of the total plant-synthesized organic substance is produced by algae in the World Ocean, and according to S. W. Jeffrey, the amount of chlorophyll c in algae is 30—80% of that of chlorophyll a. Orig. art. has: 4 figures and 4 tables.

ASSOCIATION: Institut biokhimii im. A. N. Bakha AN SSSR, Moskva (Institute of Biochemistry, AN SSSR); Laboratoriya biofiziki i izotopov AN BSSR, Minsk (Laboratory of Biophysics and Isotopes, AN BSSR)

SUBMITTED: 17Jun63

SUB CODE: LS, OP

ATD PRESS: 3065

NO REF SOV: 005

ENCL: 00

OTHER: 022

Card 3/3

YEVSTIGNEIEV, V.B., doktor biolog. nauk

Photobiological congress in Oxford. Vest. AN SSSR 34 no.12: 57-60 D '64 (MIRA 18:1)

ACCESSION NR: AP4013339 S/0020/64/154/003/0714/0717

AUTHORS: Yevstigneyev, V.B.; Gavrilova, V.A.

TITLE: Comparison of oxidizing potentials of chlorophyll and bacterial pigments under light

SOURCE: AN SSSR. Doklady*, v. 154, no. 3, 1964, 714-717

TOPIC TAGS: oxidation potential, chlorophyll, bacterial pigment, chlorophyll a chlorophyll b, photooxidation, photoreduction, photosynthesis, primary photooxidation product, photosynthetic intermediate product, photosynthetic kinetics, chlorophyll spectrum, bacterial pigment spectrum

ABSTRACT: In continuation of earlier work on the evolution of photosynthetic function, the ability of one intermediate oxidative reaction product to photosensitize another was investigated, and measured spectrophotometrically, using methanol or pyridine solutions containing chlorophyll a and/or b and bacteriochlorophyll, or

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ACCESSION NR: AP4013339

bacterioviridin, or only a mixture of the two latter. Concentration of the pigments was 0.4-0.5 x 10^{-5} mole/liter, and that of oxygen 1.5 x 10^{-3}. The chlorophylls were obtained from Urtica, the bacteriochlorophyll from Rhodepseudomonas palustris, the viridin from chlorobium thiosulfatofilum and chl.ethilicum. Results showed that the potential of the primary unstable oxidation product of a and b chlorophylls was higher than the oxidizing potential of the corresponding bacterial pigment compound. Earlier data on the higher rate of destructive photoxidation of bacterial pigments compared to chlorophylls do not contradict the authors' findings, indicating rather the high instability of the primary oxidation products of the bacterial pigments and their tendency to change into stable oxides, particularly peroxides. The possible evolution of chlorophyll, with its greater range of photosensitizing properties, from its intermediate oxidation products is discussed, as well as its double role as primary oxidizer or reducer, according to conditions. The results presented support this assumption. Orig. art. has: 3 figures.

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ACCESSION NR: AP4013339

ASSOCIATION: Institut biokhimii im. A.M. Bakha Akademii nauk SSSR (Institute of Biochemistry, Academy of Sciences (SSSR)

SUBMITTED: 30May63 DATE ACQ: 26Feb64 ENCL: 00

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

Card 3/3

YEVSTIGNEYEV, V.B.; BEKASOVA, O.D.

Photoreduction of chlorophyll A, bacterioviridin, bacteriochlorophyll and protochlorophyll in nonpolar solvents. Dokl. AN SSSR 154 no.4:946-949 F '64. (MIRA 17:3)

1. Institut biokhimii im. A.N. Bakha AN SSSR. Predstavleno akademikom A.N. Tereninym.

ACCESSION NR: AP4034548 S/0020/64/155/005/1194/1197

AUTHOR: Komissarov, G. G.; Gavrilova, V. A.; Nekrasov, L. I.; Kobozev, N. I.; Yevstigneyev, V. B.

TITLE: Photosensitizing capacity of adsorbed carotene

SOURCE: AN SSSR. Doklady*, v. 155, no. 5, 1964, 1194-1197

TOPIC TAGS: photosynthesis, photochemical reaction, redox system, β carotene, photosensitizing capacity, adsorbed β carotene

ABSTRACT: The photosensitizing capacity of β-carotene adsorbed on alumina gel or polyacrylonitrile has been studied to verify an assumption that besides chlorophyll, carotene in vivo might act as a sensitizing agent of some intermediate photochemical reaction occurring in the process of photosynthesis. The assumption was made on the basis of the structural similarity of the carotene molecule to sensitizers in photography (cyanin dyes) and to the photosensitive material of the eye (visual purple). In preliminary experiments, it was shown that β-carotene adsorbed on magnesia promoted decoloration of thyonine in the presence of ascorbic acid upon illumination with blue light. In quantitative experiments, the

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ACCESSION NR. AP4034548

extinction coefficient was measured during the process of gradual decoloration of a methyl red solution containing ascorbic acid upon illumination with blue light and in the presence of synthetic β-carotene adsorbed on alumina gel or polyacrylonitrile. Plots of the absorption of light versus time show the photosensitizing capacity of the adsorbed β-carotene. The latter in a solution did not show this capacity. The mechanism of photosensitization of the photochemical reduction by adsorbed β-carotene is linked to its behavior in the form of a complex with albumen in physiological processes. Orig. art. has: 2 figures.

ASSOCIATION: Institut biokhimii im. A. N. Bakha, AN SSSR (Institute of Biochemistry, AN SSSR)

SUBMITTED: 09Oct63 DATE ACQ: 13May64 ENCL: 00

SUB CODE: CH NO REF SOV: 012 OTHER: 010

Card 2/2

MEL'NIKOV, S.S. [Mal'nikau, S.S.]; YEVSTIGNEYEV, V.B. [Eustsihneev, V.B.]

Photosensitising action of chlorophyll c in adsorbed state. Vestsi AN BSSR. Ser. biial. nav. no.2:66-70 '65. (MIRA 18:12)

YEVSTIGNEYEV, V.B.; GAVRILOVA, V.A.

Oxidation-reduction potential of the photoreduced form of chlorophyll in pyridine. Biofizika 10 no.5:770-781 '65. (MIRA 18:10)

1. Institut biokhimii imeni A.N.Bakha AN SSSR, Moskva.

ACCESSION NR: AP5020[illegible]

AUTHOR: [illegible]

TITLE: Influence of polar [illegible] and fluorescence spectra of chlorophyll pigments in nonpolar solvents. Report, 11th Conference [illegible] Moscow [illegible]

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 4, [illegible]

TOPIC TAGS: [illegible] spectrum, absorption spectrum, [illegible] chlorophyll, solvent action.

ABSTRACT: The fluorescence of chlorophyll in nonpolar solvents is considerably increased by the presence of small quantities of polar materials. One of the authors has advanced the following explanation of this phenomenon (Lav. AN SSSR, [illegible]): the molecules (or the molecules of magnesium [illegible]) dissolved in nonpolar solvents are in the form of associated molecular [illegible] and [illegible] molecules. In view of Rabinovich (J. Amer. Chem. Soc., [illegible]), however, that the "activation" of chlorophyll fluorescence is due to formation of fluorescent [illegible]

ACCESSION NR: AP5020808

ASSOCIATION: none

SUBMITTED: [illegible] ENCL: [illegible] SUB CODE: CP, [illegible]

NO REF SOV: 007 OTHER: 000

ACCESSION NR: AP4020808

SAVKINA, I.G.; YEVSTIGNEYEV, V.B.; CHUDAR, V.S.

Spectral and photochemical properties of chlorophyllides and pheophorbides. Biokhimiia 30 no.5:1071-1079 S-O '65. (MIRA 18:10)

1. Institut biokhimii imeni A.N.Bakha AN SSSR, Moskva.

ABSTRACT: Based on the authors' earlier work showing that methyl red will

more solid and give a higher potential. The electrolyte was 0.1 or 1.5 M KCl. [illegible] pH [illegible] and [illegible] in the presence [illegible] decreased steep[illegible] and [illegible] of methyl red [illegible] with [illegible] completely replaced the [illegible] concentrations its adsorption effect [illegible] evaluation. Addition of a reducing [illegible] adsorption capacity of methyl red. It [illegible] interaction between methyl red and light irradiated pigment film may be varied by varying the pH and may then [illegible] reactions involving three electron [illegible] Orig. art. has: 1 table and 2 [illegible]

[illegible] Institute [illegible] N. Barkha AN SSSR (Institute of Biochemistry, AN SSSR)

SUBMITTED: 03Nov64 ENCL: 00 SUB CODE: GC

NR REF SOV: 011 OTHER: 002

Card 2/2

CHIBISOV, A.K.; KARYAKIN, A.V.; YEVSTIGNEYEV, V.B.; NAZAROVA, T.G.

Study of primary photochemical relationships between chlorophyll pigments and electron acceptors and donors with the help of impulse spectroscopy. Biofizika 10 no.6:1098-1100 '65. (MIRA 19:1)

1. Institut biokhimii imeni A.N.Bakha AN SSSR, Moskva. Submitted July 27, 1965.

MEL'NIKOV, S.S.; YEVSTIGNEYEV, V.B.

Study of chlorophyll-c and pheophytin-c photoreduction. Biokhimiia 30 no. 3:663-670 My-Je '65 (MIRA 19:1)

1. Institut biokhimii imeni Bakha AN SSSR, Moskva, i Laboratoriya biofiziki i izotopov AN BSSR, Minsk.

ACC NR: AP7005518

SOURCE CODE: UR/0379/66/002/005/0641/0648

AUTHOR: Stolovitskiy, Yu. M.; Yevstigneyev, V. B.

ORG: Photosynthesis Institute, AN SSSR (Institut fotosinteza AN SSSR); Biochemistry Institute im. A. N. Bakh, AN SSSR, Moscow (Institut biokhimii AN SSSR)

TITLE: Study of the change in electrical conductivity during photochemical reactions in safranine T solutions

SOURCE: Teoreticheskaya i eksperimental'naya khimiya, v. 2, no. 5, 1966, 641-648

TOPIC TAGS: safranine T, photochemistry, phenyl compound, hydrazine derivative, dye chemical, pyridine

ABSTRACT: The effect of decrease in electrical conductivity during illumination at +20 to -30°C was studied in the presence of phenylhydrazine in a pyridine solution of safranine (10^{-4}-10^{-6} M) and also certain dyes similar in structure to the latter (methylene blue and Nile, belonging to the thiazine and oxazine class). It is postulated that the conductivity decrease is due to a decrease in the mobility of the cation of the dye as a result of the formation of a complex between the cation and the molecule of the reductant (phenylhydrazine), from which an electron is transferred to the dye. It is shown experimentally that a change in conditions may change the sign of the effect, i. e., cause an increase in conductivity during illumination; this may be due to the capacity of the molecule to change from an oxidant to a reductant. Orig. art. has: 7 figures.

SUB CODE: 07/ SUBM DATE: 25Apr66/ ORIG REF: 011/ OTH REF: 005

Card 1/1

YEVSTIGNEYEV, V.G.

Some properties of averaged functions. Dokl. AN SSSR 148 no.6: 1249-1252 F '63. (MIRA 16:3)

1. Predstavleno akademikom I.M.Vinogradovym.
(Functions, Continuous)

ACC NR: AP6025641 (N) SOURCE CODE: UR/0413/66/000/013/0093/0093

INVENTOR: Arst, G. A.; Yevstigneyev, V. N.; Kheyfits, V. Z.

ORG: None

TITLE: A two-component dynamometer. Class 42, No. 183441 [announced by the State Design and Planning Scientific Research Institute of Marine Transportation (Gosudarstvennyy proyektno-konstruktorskiy i nauchno-issledovatel'skiy institut morskogo transporta)]

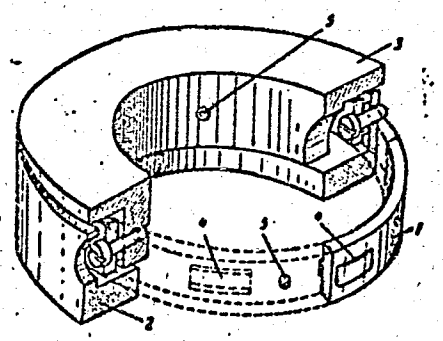
SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 13, 1966, 93

TOPIC TAGS: torque measuring instrument, elastic deformation

ABSTRACT: This Author's Certificate introduces a two-component dynamometer containing a force sensing unit, support and elastic spring element equipped with deformation gauges. Design is simplified and temperature stability is improved by fastening the elastic element rigidly to the support at three equidistant points with connection to the force sensing unit at three other points separated from the first three by a given angle. The deformation gauges of the ealstic element are mounted in the two adjacent arches formed by the fastening points.

 UDC: 531.781.002.56

ACC NR: AP6025641



1—elastic element; 2—support; 3—force sensing unit; 4—deformation gauges; 5—fastening point

SUB CODE: 13, 14/ SUBM DATE: 27May65

Card 2/2

Yevstigneyev, Vasiliy Pavlovich

YEVSTIGNEYEV, Vasiliy Pavlovich; SIDORENKOV, A.N., otvetstvennyy red.; KAZAKOV, Yu.S., red.; TSAL, R.K., tekhn.red.

[Preparation and straightening of thin sheet-metal structures in shipbuilding] Opyt izgotovleniia i pravki tonkolistovykh konstruktsii v sudostroenii. Leningrad, Gos. soiuznoe izd-vo sudostroit. promyshl., 1957. 30 p. (MIRA 11:3)

(Sheet-metal work) (Shipbuilding)

YEVSTIGNEYEV, V.P.

AUTHOR: SOKOLOVSKI,A.F., JEVSTIGNEYEV,V.P. PA - 2636

TITLE: The Study of the Working Efficiency in Political Economy in the USSR. (Izuchenie proizvodityelnosti truda v narodnom khozyaystvye SSSR. Russian)

PERIODICAL: Vestnik Akademii Nauk SSSR, 1957, Vol 27, Nr 3, pp 131-134 (U.S.S.R.)

Received: 6 / 1957 Reviewed: 7 / 1957

ABSTRACT: At the Conference (December 1956) problems of statistical methodology were discussed. A precise assessment of working efficiency is one of the fundamental tasks of calculation and statistics in the political economy of the USSR. Various suggestions were made in the course of lectures. For example, in many branches the level of working efficiency could be calculated on the basis of natural exponents. For the time being it would, however, already be necessary to establish this level for political economy as a whole. Also the importance of the drafting of a united methodology of the comparison of the level of working efficiency in the USSR. and in capitalistic countries was underlined.

It was further stated that working efficiency is in close connection with costs and can thus be calculated on the basis of cost reduction. Further, the necessity was underlined of quickly

Card 1/2

PA - 2636

The Study of the Working Efficiency in Political Economy in the USSR.

working out a system of justifiable and competitive prices. On various lectures concerning this subject a short report is given and it is stated at the end that experts in economy were beginning to take interest in these problems of statistics and were in the act of working out a method.

ASSOCIATION: Not given
PRESENTED BY:
SUBMITTED:
AVAILABLE: Library of Congress

Card 2/2

SOKOLOVSKIY, Aleksandr Fedorovich; YEVSTIGNEYEV, Viktor Pavlovich; LEONT'YEV, L.A., red.; BOGDANOVA, N., red.; MYASOYEDOV, B., red.; SHLYK, M., tekhn.red.

[Everyone must work without defective production] Kazhdyi dolzhen rabotat' bez braka. Pod obshchei red. L.A.Leont'eva. Moskva, Mosk.rabochii, 1960. 35 p. (MIRA 13:9)

1. Chlen-korrespondent Akademii nauk SSSR (for Leont'yev).
(Waste (Economics)) (Efficiency, Industrial)

SOKOLOVSKIY, Aleksandr Fedorovich; YEVSTIGNEYEV, Viktor Pavlovich; KOMAROVA, T.F., red.; RAKITIN, I.T., tekhn. red.

[Production quality] Kachestvo produktsii. Moskva, Izd-vo "Znanie," 1961. 46 p. (Vsesoiuznoe obshchestvo po rasprostraneniiu politicheskikh i nauchnykh znanii. Ser.3, Ekonomika, no.14) (MIRA 14:7)
(Quality control)

YEVSTIGNEYEV, V.P.

Coordination of economic research. Vest.AN SSSR 30 no.6: 145-146 Je '60. (MIRA 13:6)
(Economic research)

ANTONOV, V. M.; KONONOV, B. A.; YEVSTIGNEYEV, V. V.

"Magnetic Beta Spectrometer with Double Focussing for Carrying out Physics Investigations with the Electron Beam of a Betatron."

report submitted for All-Union Conf on Nuclear Spectroscopy, Tbilisi, 14-22 Feb 64.

Tomskiy politekhnicheskiy institut (Tomsk Polytechnical Inst)

ACCESSION NR: AP4024068 S/0048/64/028/002/0400/0403

AUTHOR: Kononov, B.A.; Antonov, V.M.; Yevstigneyev, V.V.

TITLE: Investigation of the energy spectrum of the electron beam from a 7.5 MeV betatron (constructed at the Tomsk Polytechnic Institute) [Report, Thirteenth Annual Conference on Nuclear Spectroscopy held in Kiev 25 Jan to 2 Feb 1963]

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v.28, no.2, 1964, 400-403

TOPIC TAGS: betatron electron spectrum, betatron output, Tomsk Polytechnic Institute betatron

ABSTRACT: The spectrum of the electrons emitted by the 7.5 MeV betatron constructed at the Tomsk Polytechnic Institute was investigated. A brief description of the betatron which has an E-shaped magnet is given. The experimental arrangement is diagramed in Fig.1 of the Enclosure. The electron distribution was analyzed by means of a sector type β-spectrometer, developed at the Institute; the electrons were detected by means of two AS-2 type gas discharge counters, connected into a coincidence circuit. The electron spectra obtained at different output energies are shown in Figs.2 and 3 of the Enclosure. Other figures in the text give the variation of

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ACCESSION NR: AP4024068

the half-width of the spectrum as a function of the electron energy, the voltage on the deflector, and the thickness of an aluminum absorber in the beam. The test results are described briefly. The tests show that under the optimum operating conditions the half-width of the electron energy spectrum does not exceed 1%. With deviation from the optimum conditions the half-width of the energy distribution in the extracted beam may increase to 5%. It is noted that these characteristics are adequate for medical purposes and radiation chemistry, but that for physical experiment requiring a high degree of accuracy a betatron of this type must be equiped with an appropriate stabilizing system. Orig.art.has: 6 figures.

ASSOCIATION: Tomskiy politekhnicheskiy institut (Tomsk Polytechnic Institute)

SUBMITTED: 00	DATE ACQ: 08Apr64	ENCL: 02
SUB CODE: NS, SD	NR REF SOV:000	OTHER: 000

Card 2/4

ACCESSION NR: AP4024068

ENCLOSURE: 01

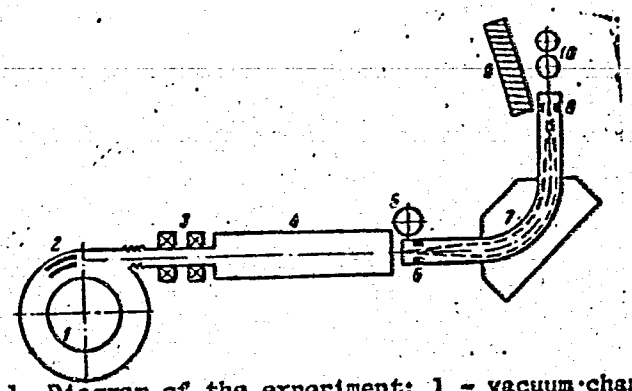

Fig.1. Diagram of the experiment: 1 - vacuum chamber of the betatron, 2 - deflector, 3 - quadrupole lenses, 4 - electron duct, 5 - ionization chamber, 6 - entrance aperture of the spectrometer, 7 - spectrometer vacuum chamber, 8 - exit aperture of the spectrometer, 9 - lead shielding, 10 - gas counters.

Card 3/4

ACCESSION NR: AP4024068

ENCLOSURE: 02

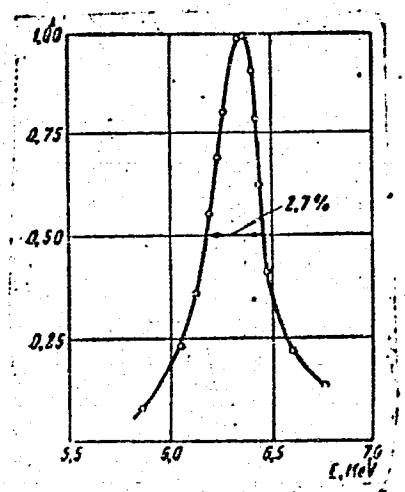

Fig.2. Energy spectrum of the electron beam from the betatron at an energy of 6.4 MeV.

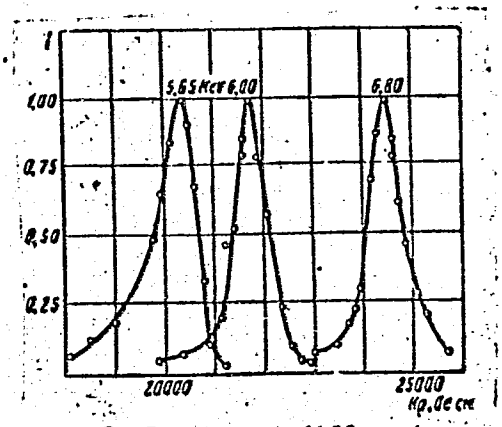

Fig.3. Spectra at different electron energies.

Card 4/4

L 08352-67 EWT(m)

ACC NR: AR6028123 SOURCE CODE: UR/0058/66/000/005/A051/A051

43

AUTHOR: Antonov, V. M.; Kononov, B. A.; Yevstigneyev, V. V.

TITLE: Double focusing magnetic Beta spectrometer for the analysis of the energy distribution of electrons with energies up to 35 MeV

SOURCE: Ref. zh. Fizika, Abs. 5A425

REF. SOURCE: Izv. Tomskogo politekhn. in-ta, v. 138, 1965, 220-227

TOPIC TAGS: beta spectroscopy, spectrometer, electron energy, electron loss, bremsstrahlung, betatron

ABSTRACT: A double-focusing magnetic β spectrometer of the sector type is described, having flat and parallel pole pieces and developed for use principally in experiments aimed at the study of the energy lost by electrons in matter. Compared with the sector spectrometer developed earlier, the present spectrometer has double focusing, a larger energy range, and better operating characteristics. In addition to working with the electron beam of a betatron, it is planned to use the spectrometer in experiments where it is necessary to investigate the energy spectrum of bremsstrahlung. In addition, it can be successfully used for an analysis of β and γ spectra of radioactive isotopes. The construction of the spectrometer permits exact tuning possible and makes possible a variety of physical investigation. L. S. [Translation of Abstract]

SUB CODE: 20

Card 1/1 net

VEVSTIONEVEV, VE. I.

[illegible] Bryovicha.

Trudy [illegible], vyp. 3(35) (Transactions of the [illegible] Institute im. M. A. Bonch-Bruyevich, No 3(35) [illegible] 400 copies printed.

Editorial Board: A. V. Gorelov, Professor, M. M. [illegible] K. P. Yegorov, Docent, I. M. [illegible], Professor, [illegible] K. V. Zolotnik, Professor, I. G. [illegible], Professor, [illegible] Docent (Resp. Ed.), M. M. Zaharov, [illegible] V. D. Rozenovskiy, Professor, Z. M. [illegible], Docent, and P. V. Shankov, Professor; Chief Ed.: V. V. [illegible]

PURPOSE: This collection of articles is for technicians and [illegible] specializing in various fields of electrical engineering.

CONTENTS: The articles cover the following topics: [illegible] explained antenna arrays, conical spiral [illegible] time-pulse method of electrical communication connections, [illegible] and Larionov circuits, $\sum_{n=1}^{\infty} e^{-n^2 \frac{\sin x}{\sin}}$ [illegible] series, and conical spiral beam antennas. No personalities are mentioned. Some of the articles are accompanied by references.

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