The Use of Radio Isotopes When Investigating the Kinetics of Scrap Fusion andSlag Formation in the Scrap-Ore Process. 89-10-22/30

$\frac{dx}{dt} = K_{SCH} (100 - x)^{2/3}$ was experimentally confirmed.

x here denotes the weight of the CaO already dissolved and K_{SCH} the proportionality coefficient for slag formation. There are 4 figures and 2 Slavic references.

SUBMITTED January 15, 1957
AVAILABLE Library of Congress

Card 2/2

Alekseyev, V.I.

18(0) PHASE I BOOK EXPLOITATION SOV/2125

Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii. Institut Metallovedeniya i fiziki metallov

Problemy metallovedeniya i fiziki metallov (Problems in Physical Metallurgy and Metallophysics) Moscow, Metallurgizdat, 1959. 540 p. (Series: Its: Sbornik trudov, 6) Errata slip inserted. 3,600 copies printed.

Additional Sponsoring Agency: USSR. Gosudarstvennaya planova komissiya.

Ed. of Publishing House: Ye.N. Berlin; Tech. Ed.: P.G. Islent'yeva; Editorial Board: D.S. Kamenetskaya, B.Ya. Lyubov (Resp. Ed.), Ye.Z. Spektor, L.M. Utevskiy, L.A. Shvartsman, and V.I. Malkin.

PURPOSE: This book is intended for metallurgists, metallurgical engineers, and specialists in the physics of metals.

COVERAGE: The papers in this collection present the results of investigations conducted between 1954 and 1956. Subjects

Card 1/18

covered include crystallization of metals, physical methods of influencing the processes of crystallization, problems in the physical chemistry of metallurgical processes, development of new methods and equipment for investigating metals, and production control. References follow each article.

TABLE OF CONTENTS:

PART I. CRYSTALLIZATION OF METALS

The distribution process was studied with the use of a radio-active isotope (Ca^{45}). It was shown that the process of diffusion of a substance in slag takes place at a considerably slower rate than in metal.

A method for determining the speed of melting scrap in an open-hearth furnace in the scrap-ore process was developed on the basis of this investigation. The method is based on "isotopic dilution" using radioactive cobalt. It was shown that the melting speed depends on the duration of the pig iron pouring process and carbon content in the bath.

The transfer of sulfur from the gas phase to the bath takes place most intensively during the loading of the metallic portion of the charge. The speed of sulfur absorption during this period is 17-25 percent per hour, during pre-heating 8-11 percent, and during final melting 3-7.5 percent. Percentage is based on the sulfur content in the metal.

84702

15.2142

S/020/60/133/006/005/016
B016/B060

AUTHORS: Alekseyev, V. I., Shvartsman, L. A.

TITLE: The Equilibrium in the System V_2C — H_2 — CH_4 — V

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 6, pp. 1331-1333

TEXT: The authors determined the free formation energy of a vanadium carbide with a composition similar to that of V_2C, which was in equilibrium with metallic vanadium. Its structure was examined by X-ray structural analysis. The authors studied the equilibrium $V_2C_{(solid)} + 2H_{2(gas)} = CH_{4(gas)} + V_{(solid)}$ (2). The equilibrium constant of reaction (2) was determined with the aid of an apparatus illustrated in Fig. 1. The carbide powder investigated was introduced into a quartz tube placed in a furnace. The furnace temperature was adjustable. Hydrogen was allowed to circulate over the powder, and subsequently, an H_2 — CH_4 mixture according to the progressing reaction (2). After

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The Equilibrium in the System
V_2C — H_2 — CH_4 — V

S/020/60/133/006/005/016
B016/B060

having obtained equilibrium, the authors burned the hydrogen in tube 2 which contained a copper oxide heated up to 300°C. The steam was frozen out in a liquid-nitrogen trap. For kinetic reasons, methane is not burned over copper oxide at 300°C (Refs. 3,4). The methane pressure was measured by means of a McLeod gauge. Since the reaction equilibrium is markedly shifted toward the left, the partial pressures of methane were very low (10^{-3} - 10^{-2} torr). In their calculation of K_r the authors equated the equilibrium pressure of hydrogen (about 190 - 300 torr) to the total pressure in the circulation apparatus. The total pressure was measured with a U-gauge (10) and by a microscopic determination of the level. Fig. 2 shows an X-ray picture of the sample investigated. Two phases are visible on it: metallic vanadium and a carbide with a hexagonal structure. According to Ref. 1, this carbide corresponds to V_2C as to its composition. The experiments were made between 600° and 1000°C. The equilibrium of reaction (1) was attained between 75 and 20 h depending on the temperature. The experimental results are represented in Fig. 3 as $\log K_r = f(1/T)$. The equation of the straight line reads: $\log K_r = 2201.9/T - 5.823$ (3), and that of the free energy is:

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The Equilibrium in the System
V_2C — H_2 — CH_4 — V

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B016/B060

$\Delta G^o_{973-1273^oK} = -10{,}050 + 26.65\ T$ (4). A combination of reaction (2) with that for the methane formation (5) yields: $2V_{(solid)} + C_{(solid)} = V_2C_{(solid)}$ (7) and $\Delta G^o_{973-1273^oK} = -11{,}500 - 0.49\ T$. The formation heat determined for vanadium carbide is a little lower than the one assumed for VC by an estimation in Ref. 2. This divergence is probably to be explained by the inaccurate determination of ΔH for VC. In vanadium-alloyed steels the excess carbide phase approaches the VC composition. The authors finally mention the applications of the above-derived equation. There are 3 figures and 6 references: 3 Soviet, and 2 German.

ASSOCIATION: Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii (Central Scientific Research Institute of Ferrous Metallurgy)

PRESENTED: March 25, 1960, by G. V. Kurdyumov, Academician

Card 3/4

84702

The Equilibrium in the System
$V_2C - H_2 - CH_4 - V$

S/020/60/133/006/005/016
B016/B060

SUBMITTED: March 25, 1960

Card 4/4

21360

S/126/61/011/004/007/023
E111/E435

15 2220 1273,1043,1142

AUTHORS: Alekseyev, V.I. and Shvartsman, L.A.

TITLE: Free Energy of Formation of Some Carbides of Vanadium and Chromium

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.11, No.4, pp.545-550 + 1 plate

TEXT: The authors describe their CH_4/H_2 equilibrium studies on the systems V_4C_3-V_2C and $Cr_{23}C_6$-Cr using a gas-circulation method. Combining these results with those for graphite, they have found the temperature dependence of the free-energy of formation from the metals and graphite of V_4C_3 and $Cr_{23}C_6$. In the literature such data for carbides are calculated from thermal values. The authors assume that the free energy of formation of $VC_{0.41}$ (called V_2C) remains constant for its homogeneity range and that the saturated solid solution of carbon in the metal can be denoted as pure metal. Using their previously described (Ref.1) apparatus and method and published data (Ref.3) they obtained the following equation for carbon solubility

$$\lg [\% C] = - \frac{11500}{4.575\,T} + 0.61 \qquad (3)$$

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E111/E435

Free Energy of Formation ...

In the present work, the same method (Ref.1) was used to find the free energy of formation from the elements of V_4C_3 and $Cr_{23}C_6$. The first was prepared by vacuum reaction of V_2O_3 with carbon at 1500 to 1700°C (Ref.4). Metallic vanadium was added and the mixture was heated to produce a system containing both V_4C_3 and V_2C over long periods. The $Cr_{23}C_6$-Cr material was made by heating lamp black with chromium powder (0.06% C, 0.03 N, 0.06 O, 0.05 Fe, 0.01 W, 0.03 Al) at 1450 to 1500°C in argon for 10 hours. In most experiments equilibrium was approached from the hydrogen side. The kinetics of the C + H_2 reaction was found, in subsidiary experiments, to be unsuitable for producing mixtures permitting an approach from the other side. The equilibrium methane pressure in a closed volume was determined after oxidation of hydrogen over copper oxide at 290 to 300°C and removal of water by freezing in liquid nitrogen. For the reaction V_4C_3 solid + $2H_2$ gas = $2V_2C$ solid + CH_4 gas it was found that

$$\Delta G^0_{973-1223°K} = -12500(\pm 400) + 28.4(\pm 1.0)\,T \qquad (8)$$

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Combination of this with Richardson's equation, for the graphite-hydrogen reaction giving methane

$$\Delta G^{0}_{500-2273^{\circ}K} = 21550 + 26.16\,T \qquad (9)$$

gives for the $2V_2C_{solid} + C_{solid} = V_4C_3$ solid reaction

$$\Delta G^{0}_{973-1223^{\circ}K} = -9000\ (\pm 400) - 2.20\ (\pm 1.0)\,T \qquad (11)$$

Combination of this with the equation for V_2C formation from the elements

$$\Delta G^{0}_{973-1273^{\circ}K} = -11500\ (\pm 600) - 0.5\ (\pm 0.6)\,T \qquad (1)$$

gives

$$\Delta G^{0}_{973-1223^{\circ}K} = -10800\ (\pm 500) - 1.1\ (\pm 0.7)\,T \qquad (12)$$

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000100930003-5"

21360

S/1?6/61/011/004/007/023
E111/E435

Free Energy of Formation ...

for the formation of V_4C_3 from the elements for 1 g atom C. For the reaction 1/6 $Cr_{23}C_6$ solid + $2H_2$ gas = 23/6 Cr_{solid} + CH_4 gas, the equation is

$$\Delta G^0_{973-1223^\circ K} = -7900\ (\pm 400) + 26.3\ (\pm 0.4)\ T \qquad (14)$$

Combination with Eq.(9) gives, for the reaction
23/6 Cr_{solid} + C_{solid} = 1/6 $Cr_{23}C_6$,

$$\Delta G^0_{973-1223^\circ K} = -13600\ (\pm 400) - 0.2\ (\pm 0.4)\ T \qquad (16)$$

This indicates a stability lower than that given by Richardson (Ref.5) but higher than that of either of the vanadium carbides. The latter is anomalous in view of the positions of the elements in the periodic table. The limiting solubility of carbon in solid chromium in equilibrium with $Cr_{23}C_6$ can be found as for the vanadium system. There are 4 figures, 1 table and 6 references: 4 Soviet and 2 non-Soviet.

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S/126/61/011/004/007/023
E111/E435

Free Energy of Formation ...

ASSOCIATION: Institut metallovedeniya i fiziki metallov TsNIIChM (Institute of Science of Metals and Physics of Metals TsNIIChM)

SUBMITTED: July 14, 1960

Card 5/5

SHILOV, V.I.; KORZH, V.P.; Prinimali uchastiye: SPITSIN, V.D.; POKHLEBAYEV, L.A.; ODINOKOVA, L.P.; ALEKSEYEV, V.I.; TELEZHNIKOVA, G.N.

Rolling of titanium alloy foil. Trudy Inst.met.UFAN SSSR no.9: 101-105 '62. (MIRA 16:10)

15.2240

S/020/61/141/002/012/027
B103/B110

AUTHORS: Alekseyev, V. I., and Shvartsman, L. A.

TITLE: Free energy of formation of manganese carbide, $Mn_{23}C_6$

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 141, no. 2, 1961, 346 - 348

TEXT: The free energy of formation of lowest-carbon manganese carbide $Mn_{23}C_6$ was determined, and the equilibrium in the system $Mn_{23}C_6$-H_2-Mn-CH_4 was studied by a method described earlier (V. I. Alekseyev, L. A. Shvartsman, DAN, 133, no. 6 (1960)). $Mn_{23}C_6$ was obtained by sintering a mixture of metallic Mn powders and carbon black at 1050°C for 24 hr in argon atmosphere. The x-ray pattern of the sample before and after the experiment showed two phases: (a) $Mn_{23}C_6$, and (b) Mn. From the results it is concluded that the equilibrium constant $K_{eq} = P_{CH_4}/P^2_{H_2}$ of the reaction $1/6\ Mn_{23}C_{6(solid)} + 2H_{2(gas)} = 23/6\ Mn^+_{(solid)} + CH_{4(gas)}$ was determined in the experiments between 650 and 900°C. The function log $K_{eq} = f(1/T)$

X

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was found to be linear. Spread of the results is explained by intensive Mn sublimation and condensation on the cold parts of the apparatus. This causes a change in the gaseous phase composition due to CH_4 and H_2 adsorption. Furthermore, careful degassing of the sample at the required temperature is impeded by the volatility of Mn. The results were evaluated by the method of least squares, and the equations $\log K_{eq923 - 1173^oK} = [4000 (\pm 380)]/T - 6.45 (\mp 0.45)$ and $\Delta G^o_{923 - 1173^oK} = -18300 (\pm 1700) + 29.51 (\pm 2.0) T$ (3) were derived. The combination of Eq. (3) with the equation for the free energy of formation of CH_4 from C and H_2 (Ref. 8, see below) gives for the reaction $23/6\ Mn_{(solid)} + C_{(graphite)} = 1/6\ Mn_{23}C_{6(solid)}$ (4): $\Delta G^o_{973 - 1173^oK} = -3300 (\pm 1700) - 3.35 (\mp 2.0) T$ (5). Hence it is concluded that the heat of formation of $Mn_{23}C_6$ (-3300 cal) is very close to that of Mn_3C. From a comparison of thermodynamic data of $Mn_{23}C_6$ (formation under heat generation) with those of Mn_7C_3 (Ref. 5, see below) the latter is assumed to be an endothermic compound.

30701

Free energy of formation...

S/020/61/141/002/012/027
B103/B110

Explanation: In the formation of carbides of transition metals of group IV, the d-shell of metal atoms is partly filled with valence electrons of C atoms. The energy of the additional electrons increases during the filling process of d-shell vacancies. Hence, the heat of carbide formation decreases as the degree of d-shell filling increases with increasing atomic number in the order Ti$\longrightarrow$Ni and also with increasing ratios between the number of C atoms and that of metal atoms in carbides. In the order Ti$\longrightarrow$Ni, chromium is an exception since the heat of formation of $Cr_{23}C_6$ (-13,600 cal) exceeds that of V_2C (-11,500 cal). On the basis of this anomaly, the structure of a free Cr atom presumably differs from that of its neighbors Mn and V by containing only one electron on level 4 s (as against 2 with Mn and V). At the same time, the d-shell of a Cr atom contains just as many electrons as the d-shell of an Mn atom. Therefore, it has 2 electrons more than the same shell of a V atom. Hence, it is assumed that the covalent bond in the formation of chromium carbides is possible by coupling one valence electron of C with the 4 s electron of Cr. There are 2 figures and 9 references: 4 Soviet and 5 non-Soviet. The three references to English-language publications read as follows:

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30701

S/020/61/141/002/012/027
B103/B110

Free energy of formation...

Ref. 2: K. Kuo, L. E. Persson, J. Iron and Steel Inst., part I, 78, 39 (1954); Ref. 5: C. McCabe, R. Hudson, J. Metals, No. 1a (1957); Ref. 8: F. D. Richardson, J. Iron and Steel Inst., 175 (1953).

ASSOCIATION: Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii im. I. P. Bardina (Central Scientific Research Institute of Ferrous Metallurgy imeni I. P. Bardin)

PRESENTED: June 12, 1961, by G. V. Kurdyumov, Academician

SUBMITTED: June 7, 1961

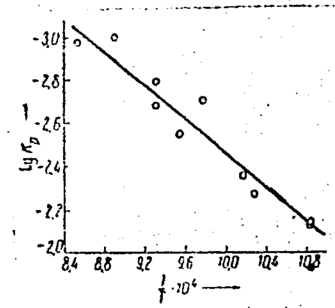

Fig. 2

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S/180/62/000/006/020/022
E021/E151

AUTHORS: Alekseyev, V.I., and Shvartsman, L.A. (Moscow)

TITLE: Free energy of formation of molybdenum carbide Mo_2C

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Metallurgiya i toplivo, no.6, 1962, 171-175

TEXT: The circulation method described earlier (DAN SSSR, v.133, no.6, 1960, 1331-1333) was used to investigate the equilibrium in the reactions

$$Mo_2C_{(solid)} + 2H_{2(gas)} = 2Mo_{(solid)} + CH_{4(gas)} \quad (2)$$

in the temperature range 600-850 °C, and the reaction

$$C_{(gr)} + 2H_{2\,(gas)} = CH_{4\,(gas)}$$

in the temperature range 700-950 °C.
Pure hydrogen (obtained electrolytically) was used. Molybdenum carbide was made by cold pressing molybdenum and carbon powders and sintering at 1500 °C for 10 hours in a purified argon

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atmosphere. For the first reaction the free energy followed the equation

$$\Delta G^0_{873-1123\ °K} = -25350 + 41.0T.$$

The results obtained for the equilibrium in the second reaction agreed with data of F.D. Richardson (The thermodynamics of metallurgical carbides and of carbon in iron, J. of Iron and Steel Inst., v.175, 1953, 45). The equation for the free energy of formation of the carbide Mo_2C, calculated from the above, was found to be

$$2Mo_{(solid)} + C_{(gr)} = Mo_2C_{(solid)}$$

$$\Delta G^0_{873-1123\ °K} = + 3800 - 14.84T$$

There are 1 figure and 2 tables.

SUBMITTED: May 26, 1962

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S/279/63/000/001/005/023
E075/E452

AUTHORS: Alekseyev, V.I., Shvartsman, L.A. (Moscow)

TITLE: Thermodynamics of reactions of formation of tungsten carbides

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Metallurgiya i gornoye delo. no.1, 1963, 91-96

TEXT: The object of the work was to obtain new experimental data necessary for the calculation of thermodynamic functions of the formation of W_2C and WC carbides. Using the circulation method the equilibria of the following reactions were investigated

$W_2C_{(s)} + 2H_{2(g)} \rightleftarrows 2W_{(s)} + CH_{4(g)}$ (in the range 923 to 1173°K)

$2WC_{(s)} + 2H_{2(g)} \rightleftarrows W_2C_{(s)} + CH_{4(g)}$ (in the range 973 to 1273°K)

Specimens of carbides were prepared by sintering compressed mixtures of powdered tungsten (R_2O_3 - 0.009%, Ni - 0.001%,

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SiO_2 - 0.01%, CaO - 0.004%, O_2 - 0.12%, S - 0.002%, P - traces, Mo - 0.023%) and carbon black (ash - 0.57%, S - 0.24%) at 1500°C in a vacuum furnace for 10 hours. The initial and final structures of the carbides were checked by X-ray examination. From the experimental results the equations for the free energy changes in the formation reactions were calculated

1) $2W_{(s)} + C_{(graphite)} = W_2C_{(s)}$ $\Delta G^\circ_{923-1173°K} = -7550 + 1.16\,T$

2) $W_2C_{(s)} + C_{(graphite)} = 2WC_{(s)}$ $\Delta G^\circ_{973-1273°K} = 3700 - 8.9\,T$

3) $W_{(s)} + C_{(graphite)} = WC_{(s)}$ $\Delta G^\circ_{973-1173°K} = -1950 - 3.9\,T$

There are 1 figure and 3 tables.

ASSOCIATION: Institut metallovedeniya i fiziki metallov TsNIIChM (Institute of Science of Metals and Physics of Metals TsNIIChM)

SUBMITTED: July 19, 1962

ALEKSEYEV, V.I.; SHVARTSMAN, L.A.

Thermodynamics of certain plain and mixed transition metal carbides.
Probl. metalloved. i fiz. met. no.8:281-304 '64. (MIRA 18:7)

EWP(t)/EWP(b) PC-4/PT-4/PS-4/...

ACCESSION NR: AP4043553 S/0020/64/157/004/0951/0953

AUTHORS: Surovoy, Yu. N.; Alekseyev, V.I.; Shvartsman, L.A.

TITLE: The thermodynamics of complex $(Fe_xMo_y)_2C$ carbides

SOURCE: AN SSSR. Doklady*, v. 157, no. 4, 1964, 951-953

TOPIC TAGS: complex iron molybdenum carbide, $(Fe_xMo_y)_2C$, thermodynamics, relative partial free energy, heat content, entropy, ...) C, (Fe ... Mo ...) C, (Fe ... Mo ...) C, carbon transi-

... Measurements were made by the circulation method described earlier by Alekseyev and Shvartsman (DAN, 133, No. 6, 1331 (1960)). X-ray from the literature.[2] For (Fe [illegible] Mo [illegible])-C, ΔG = -2300 - 4.00T(673-

L 41515-65

[illegible]

Card 3/3

ALEKSEYEV, V.I. (Moskva); SHVARTSMAN, L.A. (Moskva)

Investigating the thermodynamics of the formation of mixed iron - chromium carbides of the type $(Fe_xCr_y)_{23}C_6$. Izv. AN SSSR. Met. no.1:173-179 Ja-F '65. (MIRA 18:5)

ALEKSEYEV, V.I.; SUROVOY, Yu.N.

Method for studying the thermodynamic properties of alloys.
Zav. lab. 31 no.11:1356-1358 '65. (MIRA 19:1)

1. TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii imeni Bardina.

L 2845-66 EWT(1)/EPF(n)-2/ETC(m) WW/AT

ACCESSION NR: AP5016215 UR/0311/64/000/002/0021/0024
621.38 36 B

AUTHORS: Alekseyev, V. I. 44,55 (Candidate of technical sciences); Zhuravlev, V. I. (Engineer) 44,55

TITLE: Estimate of the dynamic properties of inertial radiation receivers

SOURCE: Svetotekhnika, no. 2, 1964, 21-24

TOPIC TAGS: radiation receiver, thermocouple, frequency characteristic

ABSTRACT: The authors first analyze the transient behavior of a thermocouple, which is the radiation receiver exhibiting the greatest inertia. A differential equation is written for the thermocouple with the radiant flux regarded as the input and with the produced thermal emf regarded as the output. The differential equation is solved in standard fashion and the frequency characteristic is determined from the transient characteristic. The authors then describe a combined

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APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000100930003-5"

L 28445-66

ACCESSION NR: AP5016215

experimental-analytic method of obtaining characteristics of inertial receivers, similar to the method used to determine the transfer functions of automatic control systems. The experimental part consisted of determining the transient characteristic of the thermocouple placed in the focus of an optical system to which light from a point source, modulated mechanically at 1 cps, was applied. The electric signal from the thermocouple was fed to a broadband amplifier and recorded. The frequency characteristic was then determined analytically by integrating the plot of the output voltage. The method is simple and is claimed to be more accurate than purely experimental methods. Orig. art. has: 3 figures and 6 formulas.

ASSOCIATION: None

SUBMITTED: 00 ENCL: 00 SUB CODE: IE

NR REF SOV: 001 OTHER: 001

BVK

Card 2/2

L 1353-66 EWT(m)/EPF(c)/EWP(t)/EWP(b) IJP(c) JD

ACCESSION NR: AP5021936

UR/0126/65/020/002/0251/0257
66.017/019

AUTHOR: Surovoy, Yu. N.; Shvartsman, L. A.; Alekseyev, V. I.

TITLE: Nature of chemical bonding in the carbides and nitrides of transition metals

SOURCE: Fizika metallov i metallovedeniye, v. 20, no. 2, 1965, 251-257

TOPIC TAGS: chemical bonding, transition metal carbide, transition metal nitride, valence electron, heat of atomization, bonding electron, bonding orbit, internal electron

ABSTRACT: On the basis of the theory that, during the formation of the metalloid compound, the valence electrons of the atoms of both components migrate to the d-level of the metal atoms, relations are derived between the heats of atomization of the carbides and nitrides of Ti and Cr and the effective charges of the atomic nuclei. Thus, it is concluded that chemical bonding in the carbides and nitrides of the transition metals is based on the d-band of the transition metals, which accepts the p-electrons of carbon or nitrogen. This bonding may to a large extent

L 1353-66

ACCESSION NR: AP5021936

have the properties of a metallic bonding but at the same time it is distinguished by the property of saturability: along with the bonding orbits, if the number of electrons in the compound exceeds a certain level, there appear orbits which weaken the bonding. The presence of bonding orbits conditions a definite proportion of covalence and the attendant properties: hardness, chemical inertia, etc. The strength of bonding, given an equal number of electrons, is determined by the electrostatic interaction between d-, s-, and p-electrons and the nuclei of the metal and metalloid, on taking into account the shielding effect of the internal electrons; the weaker this electrostatic attraction is, the stronger is the bonding in the compound. The strongest bonding in the carbides, nitrides, and borides of the transition metals is observed in cases where there are 5.5-6.5 electrons per metal atom; it is exactly in these cases that the melting points of such compounds are the highest (upward of 2600°C) and they are the most heat-resistant. This is exemplified by the case of titanium carbide: The electronic structure of Ti is $3d^24s^2$ (beyond the argon shell), and that of C, $1s^22s^22p^2$. Total number of bonding electrons: two 3d- and two 4s-electrons from Ti, minus 0.5 electron departing for the conductivity band, plus two 2p-electrons from C. Thus, the sum total of the electrons considered is 5.5. Orig. art. has:

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L 1353-66

ACCESSION NR: AP5021936

2

1 table.

ASSOCIATION: TsNIIChERMET im. I. P. Bardina 55

SUBMITTED: 13Jul64 ENCL: 00 SUB CODE: MP, MM

NO REF SOV: 008 OTHER: 007

Card 3/3

COUNTRY : USSR. 3

CATEGORY : Zoological Parasitology. Acarids and Insects as Disease Vectors. Insects.

ABS. JOUR. : RZhBiol., No. 14,1959, No. 62687.

AUTHORS : Alekseyev, V. K.; Mikulin, M.A.

INST. : ~~Central-Asian~~ Scientific-Research Anti-Plague*

TITLE : Seasonal Flea Infestation of Large Gerbils in the sands of the Ili-River Region.

ORIG. PUB. : Tr. Sredne-Aziatsk. n.-i. protivochumn. in-ta, 1956, vyp. 2, 53-60.

ABSTRACT : 11 flea species were found on gerbils (10 from them are specific parasites). Most numerous are the fleas of the genus Xenopsilla. According to the character of seasonal changes in the number of fleas, the large gerbils are divided into 3 groups: "spring-summer", with a rise in numbers in warm months and a maximum rise in the spring period; the "summer" groups are encountered only in warm months

CARD: 1/2

*Institute.

GELLER, Boris Petrovich; KUZIN, Mikhail Yakovlevich; LOSHCHENKOV, Vadim Yakovlevich; LEVITSKIY, Bentsion Aron[illegible]; ALEKSEYEV, V.K., spets. red.; VOLOSHCHENKO, Z N., red.

[Financing and calculations in construction; consultations and explanations] Finansirovanie i raschety v stroitel'stve; konsul'tatsii i raz"iasneniia. Kiev, Budivel'nyk, 1964. 199 p. (MIRA 17:10)

1. Ukraine. Gosudarstvennyy komitet po delam stroitel'stva.

ALEKSEYEV, V. Kh.

"Arrangement of Hydroelectric Power Plants in Cascade." Cand Tech Sci, Power Engineering Inst imeni G. M. Krzhizhanovskiy Acad Sci USSR, Moscow, 1954. (KL, No 2, Jan 55)

Survey of Scientific and Technical Dissertations Defended at USSR higher Educational Institutions (12)
SO: Sum. No. 556, 24 Jun 55

KLOPOV, Sergey Vasil'yevich; ALEKSEYEV, Vladimir Khrisanfovich; ZOTOVA, Vera Mikhaylovna; KUDINOV, Aleksandr Georgiyevich; MARKIN, Arkadiy Borisovich; SEMENTSOV, V.A., otv.red. [deceased]; NEMCHENKO, V.S., red.izd-va; YEGOROVA, N.F., tekhn.red.

[Power resources and power engineering in southern areas of the Yakut A.S.S.R.] Energeticheskie resursy i energetika iuzhnykh raionov IAkutskoi ASSR. Moskva, Izd-vo Akad.nauk SSSR, 1959. 58 p. (MIRA 12:10)
(Yakutia--Power resources)

ALEKSEYEV, V.L., insh.

Use of water level lowering wells during the building of the 1-Kapital'naia Mine. Izv.vys.ucheb.zav.; gor.zhur. no.1: 21-29 '59, (MIRA 13:1)

1. Trest Boksitstroy. Rekomendovana kafedroy shakhtostroya Sverdlovskogo gornogo instituta.
(Ural Mountain region--Mine waters)
(Mine pumps)

ALEKSEYEV, V.L., inzh.; POLOVOV, B.D., inzh.; SHCHUKIN, A.S., kand. tekhn. nauk

Construction of a watertight barrier in a shaft by the underwater concreting method. Shakht. stroi. 8 no.5:25-28 My'64 (MIRA 17:7)

1. Trest Boksitstroy (for Alekseyev). 2. Sverdlovskiy gornyy institut (for Shchukin).

ALEKSEYEV, V.L., inzh.; POLOVOV, B.D., inzh.; SHCHUKIN, A.S., kand.tekhn.nauk

Ground cementation from the working face during vertical shaft sinking. Shakht.stroi. 8 no.11:25 N '64. (MIRA 18:1)

1. Trest Boksitstroy (for Alekseyev). 2. Sverdlovskiy gornyy institut (for Shchukin).

L [illegible] EWP(e)/EWT(m)/EWP(i)/EWP(t) Pq-4/Pet [illegible]

ACCESSION NR: AP5013993 [illegible]/0739/0759

[illegible], V.A.

TITLE: Investigation of the excited states and the isomeric state of [illegible] by observation of the gamma rays from neutron capture /Report, 15th Annual Conference on Nuclear Spectroscopy and the Structure of the Atomic Nucleus held in Minsk, 25 Jan-2 Feb 1965/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v.29, no.5, 1965, 739-759

TOPIC TAGS: gamma ray spectrum, neutron capture, rhodium

ABSTRACT: The gamma rays emitted in the $Rh^{103}(n,\gamma)Rh^{104}$ reaction [illegible]

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ACCESSION NR: AP5013993

tions. The energies and intensities of 168 gamma rays are tabulated.

ACCESSION NR: AP5013993

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Card 3/3

ALEKSEYEV, V.M.

OTRESHKO, Anatoliy Ivanovich, doktor tekhnicheskikh nauk, professor, redaktor; IVYANSKIY, A.M., kandidat tekhnicheskikh nauk, dotsent; SHMURNOV, K.V., kandidat tekhnicheskikh nauk, dotsent; ALEKSEYEV, V.M., redaktor; KOBYLYAKOV, L.M., redaktor; PERESYPKINA, Z.D., tekhnicheskiy redaktor; BALLOD, A.I., tekhnicheskiy redaktor.

[Hydraulic engineering structures] Inzhenernye konstruktsii v gidromeliorativnom stroitel'stve. Pod obshchei red. A.I.Otreshko. Moskva, Gos.izd-vo sekhoz. lit-ry, 1955. 551 p. (MLRA 9:1)
(Hydraulic engineering)

SOV/112-57-9-18508D

Translation from: Referativnyy zhurnal, Elektrotekhnika, 1957, Nr 9, p 58 (USSR)

AUTHOR: Alekseyev, V. M.

TITLE: Control of Soil-Water Seepage by the Colmatation Method
(Bor'ba s fil'tratsiyey vody v gruntakh metodom kol'matatsii)

ABSTRACT: Bibliographic entry on the author's dissertation for the degree of Candidate of Technical Sciences, presented to Voronezhsk. s.-kh. in-t (Voronezh Agricultural Institute), Voronezh, 1956.

ASSOCIATION: Voronezhsk. s.-kh. in-t (Voronezh Agricultural Institute)

Card 1/1

LIN' TSZIA-TSZIAO [Lin Chia-chiao]; ALEKSEYEV, V.M. [translator];
FAL'KOVICH, S.V., red.

[The theory of hydrodynamic stability] Teoriia gidrodinamicheskoi ustoichivosti. [Translated from the English] Perevod s angliiskogo V.M.Alekseeva. Pod redaktsiei S.V.Fal'kovicha. Moskva, Izd-vo inostrannoi lit-ry, 1958. 194 p. (MIRA 12:3)
(Hydrodynamics)

ALEKSEYEV, V.M.; BERDYSHEV, V.D.; BOGOMOLOV, V.S.

Electrometric method of measuring the pressure gradient in determining the water permeability of soils. Pochvovedenie no.6:99-100 Je '60.
(MIRA 13:11)

1. Voronezhskiy inzhenerno-stroitel'nyy institut.
(Soil moisture)

LIPSON, G.A., prepodavatel'; ALEKSEYEV, V.M., prepodavatel'

Instrument for determining the content of moisture in soils. Suggested by G.A.Lipson, V.M.Alekseev. Rats.i izobr.predl.v stroi. no.16:104-107 '60. (MIRA 13:9)

1. Voronezhskiy inzhenerno-stroitel'nyy institut, Voronezh, ul. XX-letiya Oktyabrya, d. 146-a.
(Moisture--Measurement)

LARIONOV, A.K.; ALEKSEYEV, V.M.; LIPSON, G.A.; NEMANOVA, G.F., red. izd-va; SHMAKOVA, T.M., tekhn. red.

[Soil moisture and present methods of determining it]Vlazhnost' gruntov i sovremennye metody ee opredeleniia. Moskva, Gosgeoltekhizdat, 1962. 133 p. (MIRA 15:11)

(Soil moisture)

ALEKSEYEV, V.M.

3

16(1)

AUTHOR: Alekseyev, V.M. SOV/55-58-5-3/34

TITLE: Existence of a Bounded Function of Maximum Spectral Type (Sushchestvovaniye ogranichennoy funktsii maksimal'nogo spektral'nogo tipa)

PERIODICAL: Vestnik Moskovskogo universiteta, Seriya matematiki, mekhaniki, astronomii, fiziki, khimii, 1958, Nr 5, pp 13 - 16 (USSR)

ABSTRACT: Let $L^2_\mu(\Omega)$ be the Hilbert space of the functions which are defined on Ω and summable in square with respect to the measure μ. In $L^2_\mu(\Omega)$ let the spectral measure $E(M)$ be considered, i.e. a family of projection operators depending countably additively on a measurable (B) set of the numerical line. The set function $\sigma_f(M) = (E(M)f,f)$ is a generalized measure.
Theorem : If $L^2_\mu(\Omega)$ is separable, then to every $f \in L^2_\mu(\Omega)$ and to every $\varepsilon > 0$ there exists a bounded function $g \in L^2_\mu(\Omega)$, so that $\|f-g\| < \varepsilon$ and $\sigma_f \ll \sigma_g$ ($\ll$ denotes absolute continuity).

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Existence of a Bounded Function of Maximum Spectral Type SOV/55-58-5-3/34

In particular : If f is of maximum spectral type, then g is of maximum spectral type too.
There are 2 references, 1 of which is Soviet, and 1 American.

ASSOCIATION: Kafedra differentsial'nykh uravneniy (Chair of Differential Equations)

SUBMITTED: July 18, 1958

Card 2/2

ALEKSEYEV, V. M., Candidate Phys-Math Sci (diss) -- "Some qualitative results in the problem of three and more bodies". Moscow, 1959. 8 pp (Moscow Order of Lenin and Order of Labor Red Banner State U im M. V. Lomonosov), 150 copies (KL, No 24, 1959, 124)

88201

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S/020/60/134/002/026/041XX
C 111/ C 333

AUTHOR: Alekseyev, V. M.

TITLE: The Asymptotic Behaivior of Solutions to Slightly Nonlinear Systems of Ordinary Differential Equations

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 2, pp. 247-250

TEXT: Let X be an n-dimensional vector space, T an interval of the real axis; $x \in X$, $t \in T$. Let

(1) $\frac{dx}{dt} = A(x, t)\, x + f(x,t)$,

where A is a matrix of n-th order. In the case of an "almost constant" A and of a small f the solutions of (1) can be compared with the solution $x(t) = \exp\left\{A(x_0, t_0)(t-t_0)\right\} x(t_0)$ of

(2) $\frac{dx}{dt} = A(x_0, t_0)\, x$.

If $\Lambda(A) = \max \mathrm{Re}\, \lambda_i(A)$, where $\lambda_i(A)$ are the characteristic roots of the matrix A, then it holds the following improvement of an

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The Asymptotic Behavior of Solutions to Slightly Nonlinear Systems of Ordinary Differential Equations

estimation given in (Ref.4):

$$(4) \quad \| e^{At} \| \leq \sum_{k=0}^{n-1} \frac{(2t\|A\|)^k}{k!} e^{\Lambda(A)t} .$$

The aim of the paper is the estimation of the influence of the dependence of the matrix A from χ and t on the increase of the solution.

Theorem 1: Let $\chi(t)$ and $B(t) = A(\chi(t), t)$ be absolutely continuous on $[t_0, t_1] \leq T$; $t_0 \leq s \leq t_1$, $0 \leq \tau \leq t_1 - s$ and

1.) $\left\| \frac{dB(s)}{ds} \right\| \leq \psi(s)$ 2.) $\left\| \frac{d\chi(s)}{ds} - B(s)\chi(s) \right\| \leq \varphi(s)$

3.) $\| \exp\{B(s)\tau\} \| \leq \eta(\tau; s)$

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The Asymptotic Behavior of Solutions to Slightly Nonlinear Systems of Ordinary Differential Equations

4.) $\varphi(s)$, $\psi(s)$ integrable on $[t_0, t_1]$; $\eta(\tau, s)$ bounded

5.) $K(t,s) = \int_s^t \eta(t-\sigma, s)\, \eta(\sigma - s, s)\, d\sigma$ for $t_0 \leqq s \leqq t \leqq t_1$.

Then it holds $\| x(t) \| \leqq g(t)$ for all $t \in [t_0; t_1]$, where $g(t)$ is the solution of

(7) $$g(t) = \eta(t-t_0, t_0) \| x(t_0) \| + \int_{t_0}^{t} \varphi(s)\, \eta(t-s,s)\, ds + \int_{t_0}^{t} K(t,s) \psi(s)\, g(s)\, ds .$$

The author considers

(9) $$\frac{dx}{dt} = A(t)x + f(x, t) .$$

Theorem 2: If for all $t, t' \geqq t_0$, $s \geqq 0$:

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The Asymptotic Behavior of Solutions to Slightly Nonlinear Systems of Ordinary Differential Equations

1.) $\| \exp \{ A(t)s \} \| \leq \eta(s)$ 2.) $\| f(x,t) \| \leq \omega \|x\|$

3.) $\| A(t') - A(t) \| \leq \delta |t' - t|$ and if λ is so that

$$(10) \qquad \int_0^\infty e^{-\lambda s} \eta(s)\, ds \leq \frac{2}{\omega + \sqrt{\omega^2 + 4\delta}} ,$$

then there exists a $K > 0$ such that it holds

$$(11) \qquad \| x(t) \| \leq K e^{\lambda(t-t_0)} \| x(t_0) \|$$

for all solutions of (9).

Let denote

$$C(\varkappa, s) = \frac{d}{ds} A(\varkappa(s), s).$$

Theorem 3: For certain positive L, q, τ and all $s \geq 0$ it is assumed to hold in the case, where

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C 111/ C 333

The Asymptotic Behavior of Solutions to Slightly Nonlinear Systems of Ordinary Differential Equations

N. Ya. Lyashchenko os mentioned in the paper.

There are 4 references: 3 Soviet and 1 American.

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

PRESENTED: May 6, 1960, by A. N. Kolmogorov, Academician

SUBMITTED: April 27, 1960

Card 6/6

21213

3,2200 (1041,1080,1104)

S/188/61/000/001/008/009
B104/B203

AUTHOR: Alekseyev, V. M.

TITLE: Notes on criteria for hyperbolic and hyperbolic-elliptic motion

PERIODICAL: Vestnik Moskovskogo universiteta. Seriya 3, fizika, astronomiya, v. 16, no. 1, 1961, 67-75

TEXT: The author studies the motion of n gravitating points $P_0, P_1, \ldots, P_{n-1}$ having the masses $m_0, \ldots, m_{n-1}$. As is known, a motion is called hyperbolic if with $t \longrightarrow \infty$ the distance between two points $r_{ij}(t) > ct$ with $c > 0$ and $t > t_1$. For n = 3, the case of hyperbolic-elliptic motion is also studied. Criteria for the type of motion have been indicated in earlier papers. In the present paper, the author gives three lemmas and two theorems including proofs for their correctness. Lemma 1: If x(t) on the trajectory [0, T] is steady in the phase space of the system investigated, and D is a range (open set) of this phase space so that with $x(0) \in D$ also

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$x(t)\in D$ on the semi-open interval $[0;t_1)\subseteq[0;T)$, then it follows that with $x(t_1)\in D$ also $x(t)\in D$ for all $t\in[0;T]$. The proof of this lemma is called trivial. Lemma 2: If for all $s\in[0,T]$,

$$|\dot{\rho}(s)-\dot{\rho}(0)|\leqslant\varepsilon<\frac{|\dot{\rho}(0)|+\dot{\rho}(0)}{2}, \qquad (1)$$

then it follows that

$$\int_0^t\frac{dt}{\rho^2}\leqslant\frac{2}{\rho(0)\,[|\dot{\rho}(0)|+\dot{\rho}(0)-2\varepsilon]};\quad \int_0^t\frac{dt}{\rho^3}\leqslant\frac{1}{\rho^2_{(0)}\,[|\dot{\rho}(0)|+\dot{\rho}(0)-2\varepsilon]}. \qquad (2)$$

Theorem 1: If, for t = 0 and all $i<j$, the inequality

$$\gamma\left\{\sum_{k\neq i}\frac{m_k}{r^0_{ki}(v^0_{ki}+\dot{r}^0_{ki})}+\sum_{k\neq j}\frac{m_k}{r^0_{kj}(v^0_{kj}+\dot{r}_{kj})}\right\}<\frac{v^0_{ij}+\dot{r}^0_{ij}}{16}, \qquad (5)$$

$$r^0_{kl}=r_{kl}(0)$$

$$v^0_{kl}=v_{kl}(0)$$

$$\dot{r}^0_{kl}=\dot{r}_{kl}(0)$$

is satisfied, then the inequality $r_{ij} > |\bar{r}_{ij}^0 + \bar{v}_{ij}^0 t| - \frac{v_{ij}^0 + \dot{r}_{ij}^0}{4} t$, (A)

holds for $t > 0$. It is concluded from this lemma that if $8M/\rho\sigma^2 < 1$, then all $r_{ij} \longrightarrow \infty$ for $t \longrightarrow +\infty$. Lemma 3: If $\rho > ar$, then

$$\Psi \leqslant \frac{\gamma(m_0 + m_1 + m_2) A}{\rho^2}, \quad (8)$$

$$\Phi \leqslant \frac{\gamma m_2 r B}{\rho^3}. \quad (9)$$

Finally, theorem 2 is given stating that

$$4\gamma(m_0 + m_1 + m_2) A < \rho_0 w_0 \dot{\rho}_0,$$

$$\frac{\gamma(m_0 + m_1)}{r_0} - \frac{u_0^2}{2} > \left[\frac{3}{2\sqrt{2}} \frac{\gamma^2 m_2 (m_0 + m_1)}{\rho_0^2 w_0} B + \left(\frac{a\gamma(m_0 + m_1)}{\rho_0}\right)^{3/2}\right]^{2/3}. \quad (10)$$

for $\rho_0 > 0$. Then, $\rho > |\rho_0 + \bar{\omega}_0 t| - \dot{\rho}_0 t/2$, $r < \rho_0/a$ holds for all $t > 0$. G. F. Khil'min, G. A. Merman, and K. A. Sitnikov are mentioned in the partly extensive demonstrations. There are 5 Soviet-bloc references.

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Notes on criteria for hyperbolic... S/188/61/000/001/008/009
B104/B203

ASSOCIATION: Kafedra matematicheskogo analiza mekh.-mat (Department of Mathematical Analysis in Mechanics and Mathematics)

SUBMITTED: October 10, 1960

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24562

S/055/61/000/002/003/007
C111/C222

16.3400

AUTHOR: Alekseyev, V.M.

TITLE: On an estimation of the perturbations of the solutions of systems of ordinary differential equations. I

PERIODICAL: Moscow. Universitet. Vestnik. Seriya I. Matematika, mekhanika, no.2, 1961, 28-36 V.16

TEXT: Given the systems

$$\frac{d\vec{x}}{dt} = \vec{X}(t,\vec{x}) \qquad (1.1)$$

$$\frac{d\tilde{\vec{x}}}{dt} = \vec{X}(t,\tilde{\vec{x}}) + \vec{\Phi}(t,\tilde{\vec{x}}), \qquad (1.2)$$

and let $\vec{x}(t)$ and $\tilde{\vec{x}}(t)$ be any solutions of (1.1) and (1.2). Let a solution be known on a certain interval. Problem: Estimate the interval on which there exists the other solution, and estimate the deviation between the solutions.

Let $\vec{X}$ and its first partial derivatives be continuous in a region of the (n+1)-dimensional space. Let $S_c^t\vec{x}$ be a solution of (1.1) which for

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$t = \tau$ goes through $\vec{x}$. Let the matrix A be defined by

$$A(\vec{x}, \tau, t) = \frac{\partial}{\partial \vec{x}} (S_\tau^t \vec{x}).$$

Lemma 1: If for a $t > \tau$ and all $\vec{\xi}(s) = \vec{x}_0 + (\vec{x} - \vec{x}_0)s$ it holds

$$|A(\vec{\xi}(s), \tau, t)| \leq \Psi(s, \tau, t)$$

then

$$|S_\tau^t \vec{x} - S_\tau^t x_0| \leq \int_0^1 \Psi(s, \tau, t) ds |\vec{x} - \vec{x}_0|.$$

Let $\vec{\tilde{x}}$ be an arbitrary differentiable vector function and

$$\vec{\Phi}(t) = \frac{d\vec{\tilde{x}}}{dt} - \vec{X}(t, \vec{\tilde{x}}(t)). \qquad (1.9)$$

Lemma 2: If for all τ_1, τ_2, where $t_0 \leq \tau_1 \leq \tau_2 \leq t$, the function $\vec{x}(\tau_1, \tau_2) = S_{\tau_1}^{\tau_2} \vec{\tilde{x}}(\tau_1)$ is defined then for $\tau \in [t_0, t]$ it holds:

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$$S_{\tau}^{t}\tilde{\vec{x}}(\tau) = S_{t_o}^{t}\tilde{\vec{x}}(t_o) + \int_{t_o}^{\tau} A(\tilde{\vec{x}}(s), s, t)\,\vec{\Phi}(s)ds. \qquad (1.10)$$

Definition: A family D_t of sets of the n-dimensional space is called normal if for every t and every $x \in D_t$ there exists a neighborhood $U(\vec{x})$ and a $t' > t$ so that $U(\vec{x}) \subset D_s$ for all $s \in (t, t')$.

Lemma 4: If $\vec{x}(t)$ is a continuous trajectory on $\delta = [0,T)$ or $\delta = (0,T)$ and if

1) D_t, $t \in \delta$, is a normal family;

2) for all $\tau \in (0,T)$ from $\vec{x}(t) \in D_t$ it follows $\vec{x}_{\tau} \in D_{\tau}$ for $t \in (0,\tau)$;

3) $\vec{x}(0) \in D_o$ in the case $\delta = [0,T)$ or $\vec{x}(t) \in D_t$ for $t \in (0,t')$, $t' > 0$;

then $\vec{x}(t) \in D_t$ for all $t \in \delta$.

Let in $\mathcal{O}_{\delta}$ the function $\vec{\Phi}$ satisfy the Lipschitz condition in $\tilde{\vec{x}}$. Let G_t be the intersection of $\mathcal{O}_{\delta}$ through t = const.

Theorem 1: Let 1) $D_t \subset \mathcal{O}_{\delta t}$ be a normal family on $[t_o, T)$; 2) for all t_1, t, where $t_o < t_1 < t < T$ and $x \in D_t$ let the solution $S_{t_1}^{t}\vec{x}$ of (1.1) be defined, where

$$|A(\vec{x}, t_1, t)| = \left|\frac{\partial}{\partial \vec{x}} S_{t_1}^{t}\vec{x}\right| \leqslant \Psi_1(t_1, t);$$

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3) for all $t \in [t_o, \tau)$ and $\vec{x} \in D_t$ let $|\vec{\Phi}(t,\vec{x})| \leq \vec{N}(t)$; 4) $\vec{\delta}(t) = \Psi(t_o,t)\vec{\delta}(t_o) + \int_{t_o}^{t} \Psi(\tau,t)\vec{N}(\tau)d\tau$; 5) $U(\overline{S_{t_o}^{t}\vec{x}_o, \delta(t)}) \subseteq D_t$ for $t_o \leq t < T$; 6) $|\tilde{\vec{x}}_o - \vec{x}_o| \leq \vec{\delta}(t_o)$. Then the solution $\tilde{S}_{t_o}^{t}\tilde{\vec{x}}_o$ of (1.2) is defined for $t \in [t_o, T)$ and it holds

$$|\tilde{S}_{t_o}^{t}\tilde{\vec{x}}_o - S_{t_o}^{t}\vec{x}_o| \leq \vec{\delta}(t).$$

The author mentions N.D.Moiseyev, G.V.Kamenkov, G.F.Khil'mi and S.M. Lozinskiy. There are 7 Soviet-bloc and 1 non-Soviet-bloc references.

ASSOCIATION: Kafedra matematicheskogo analiza (Chair of Mathematical Analysis)

SUBMITTED: May 5, 1960

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22719

16.3410

S/055/61/000/003/001/004
D235/D302

AUTHOR: Alekseyev, V.M.

TITLE: Estimation of disturbances in the solution of ordinary differential equations

PERIODICAL: Moskva. Universitet. Vestnik. Seriya I. Matematika, mekhanika, no. 3, 1961, 3 - 10

TEXT: This article is a continuation of the same theme published in the previous issue of this periodical. Variation of the right hand members in a system of ordinary differential equations may lead to some disturbances of its solutions. Two further lemmas and two theorems give an estimation of these disturbances and the criterion for stability. The author assumes that vectors in a n-dimension space are supplied with a norm //X// and that a norm matrix //A// is formed. A logarithmic matrix γ(A) is denoted after S. Lozinskiy (Ref. 3: Otsenka pogreshnostey chislennogo integrirovaniya obyknovennykh differentsial'nykh uravneniy. Izvestiya vuzov. No. 5, 1958)

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as

$$\gamma(A) = \lim_{h \to +0} \frac{//E + hA// - 1}{h}.$$

The author then proves two lemmas: Lemma 6: If $\vec{x}(t)$ is the solution of equation

$$\frac{d\vec{x}}{dt} = A(t)\vec{x} + \vec{f}(t, x) \qquad (2.1)$$

and for $t \leq t \leq t_1$; 1) A(t) is continuous and $\gamma(A(t)) \leq \gamma(t)$, 2) $//\vec{f}(t, \vec{x})// \leq f_1(t)//\vec{x}// + f_2(t)$, then for this t:

$$\|\vec{x}(t)\| \leqslant e^{\int_{t_0}^{t}[\gamma(\sigma)+f_1(\sigma)]d\sigma} \|\vec{x}(t_0)\| + \int_{t_0}^{t} f_2(s)\, e^{\int_{s}^{t}[\gamma(\sigma)+f_1(\sigma)]d\sigma} ds. \qquad (2,2) \qquad (2.2)$$

and Lemma 7: If $N(t) \geq 0$, q(t) 0 and (t) are continuous in (t_0, t_1) and for all t_0 t t_1, 0 $_1$, and a function

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$$\varphi(\lambda, \tau, t) \leqslant \int_0^{\lambda} e^{\int_{t_0}^{t} [\gamma(\sigma) + q(\sigma)\varphi(\mu, t_0, \sigma)] d\sigma} d\mu + \int_{t_0}^{\tau} N(s) e^{\int_s^t [\gamma(\sigma) + q(\sigma)\varphi(\lambda, s, \sigma)] d\sigma} ds, \quad (2,3) \qquad (2.3)$$

then for the indicated values τ, t and λ

$$\varphi(\lambda, \tau, t) \leqslant f(\lambda, \tau, t) \leqslant f_0(\lambda, t), \quad (2,4) \qquad (2.4)$$

where f_0 and f_1 are the solutions of Riccati's equations

$$\frac{\partial f}{\partial t} = \gamma(t) f + \frac{1}{2} q(t) f^2, \qquad f(\lambda, \tau, t)_{t=\tau} = f_0(\lambda, \tau) \qquad (2.5)$$

$$\frac{\partial f_0}{\partial \tau} = N(\tau) + \gamma(\tau) f_0 + \frac{1}{2} q(\tau) f_0^2, \qquad f_0(\lambda, t_0) = \lambda. \qquad (2.6)$$

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Estimation of disturbances ...

Theorem 2 states: Let $q(t) \geqslant 0$, $N(t) \geqslant 0$, $\gamma(t)$ - continuous, and $g(t)$ be a differentiable function; $U_t = U(S^t_{t_0} \vec{x}_0, g(t))$ and for $t_0 \leqslant t < T_0 \leqslant T$ the conditions are satisfied:

1) Quantity [Множество] $\{(t, \vec{x});\ t_0 \leqslant t \leqslant T,\ \vec{x} \in \overline{U}_t\} \subset \mathfrak{G}$;

2) $\|J(t, \vec{y}) - J(t, S^t_{t_0}\vec{x}_0)\| \leqslant q(t)\|\vec{y} - S^t_{t_0}\vec{x}_0\|,\ \vec{y} \in U_t$;

3) $\gamma(J(t, S^t_{t_0}\vec{x}_0)) \leqslant \gamma(t)$;

4) $\|\vec{\Phi}(\vec{y}, t)\| \leqslant N(t),\ \vec{y} \in U_t$;

5) $q'(t) \geqslant N(t) + \gamma(t)g(t) + \frac{1}{2}q(t)g^2(t)$;

6) $\|\vec{x}_0 - \vec{x}_0\| < g(t_0)$.

Then for the half-interval (t_0, T_0) there exists a solution for

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vennykh differentsial'nykh uraveneniy DAN (Evaluation of Error in Solving the System of Ordinary Differential Equations) 92, 225-228, 1953) and (Ref. 2: O priblizhennom reshenii sistem obyknovennykh differentsial'nykh uraveneniy DAN (On the Approximate Solving of Systems of Differential Equations) 94, 29-32, 1954) when applying Theorem 2 it is possible to transform the systems (2.9) and (2.10) using the linear replacing of the variables $\vec{x} = U(t)\vec{\xi}$. Then the matrix $J(t, \vec{x})$ shall be replaced by the matrix $Q = U^{-1}JU - U^{-1}\frac{du}{dt}$. U should be selected so that the $\gamma(A)$ would be possibly smaller. There is a connection between Theorems 1 and 2 with the "technical stability" as quoted in N.D. Moiseyev (Ref. 4: Obzor razvitiya nel-yapunovskikh teoriy ustoychivosti. Tr. Voyenno-vozd. akad. im. N. Ye. Zhukovskogo. Zapiski seminara po teorii ustoychivosti dvizheni-ya vyp. 1, 1946) and the "stability of the finite interval" of G.V. Kamenkov (Ref. 5: Ob. ustoychivosti dvizheniya na konechnom inter-vale vremeni PMM, 17: 5, 529-540, 1933). The problem considered by N.D. Moiseyev is as follows: The "undisturbed" solution of a system

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$S^t_{t_o} x_o$ (2.9)

$$\frac{d\vec{x}}{dt} = \vec{X}(t, \vec{x}) \quad (2.9)$$

(2.9)

is known. Given is a zone D surrounding this solution; it is known that the disturbances of the right hand side members do not exceed a N(t). It is required to find such a relationship between the data and the disturbances of the initial conditions at which "the disturbed" solution

$$\tilde{S}^t_{t_o} \tilde{\vec{x}}_o$$

of the system (2.10) does not exceed D. Also the definition of the stability on the finite interval introduced by G.V. Kamenkov (Ref. 5: Op.cit.) could lead to the solution $S^t_{t_o} x_o$ of a system (2.9), which would be stable in the interval $[t_o, T_o]$ at constantly act-

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ing disturbances $\varnothing$, if there exists $A > 0$, so that for all $\vec{x} \in U(x_0 A)$ the solution $S^t_{t_0} \vec{x} \in U(S^t_{t_0} \vec{x}_0, A)$. Theorem 2a states that if $q(t) \geqslant 0$, $N(t) \geqslant 0$ and $\gamma(t)$ are continuous for some $A > 0$, and t and $\vec{x}$ such, that $t_0 \leqslant t \leqslant T$, $\|\vec{x} - S^t_{t_0} \vec{x}_0\| \leqslant A$:

1) $(t, \vec{x}) \in \mathfrak{G}$;

2) $\|J(t, \vec{x}) - J(t, S^t_{t_0}\vec{x}_0)\| \leqslant q(t) \|\vec{x} - S^t_{t_0}\vec{x}_0\|$.

3) $\gamma(J(t, S^t_{t_0}\vec{x}_0)) \leqslant \gamma(t)$;

4) $\|\vec{\Phi}(t, \vec{x})\| \leqslant N(t)$;

5) $N(t) + \gamma(t) A + \frac{q}{2} A^2 \leqslant 0$.

Then the solution $S^t_{t_0} \vec{x}_0$ is stable in the finite interval $[t_0, T]$

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at constantly acting disturbances. The authors note that if the matrix J in Theorem 2a changes slowly, it may be advisable to transform the leading $J(t_0, x_0)$ to Jordan's normal form. There are 5 Soviet-bloc references.

ASSOCIATION: Kafedra matematicheskogo analiza (Department of Analytical Mathematics)

SUBMITTED: May 5, 1960

X

Card 9/9

20852

S/033/61/038/002/006/011
E032/E414

3,1400 (1080,1109,1041)

AUTHOR: Alekseyev, V.M.

TITLE: On a Theorem in the Theory of Perturbed Motion

PERIODICAL: Astronomicheskiy zhurnal, 1961, Vol.38, No.2, pp.325-335

TEXT: The present author considers solutions of the system of equations describing perturbed motion which, in the vector form, can be written down as follows

$$\frac{d\bar{r}}{dt} = \bar{u}; \quad \frac{d\bar{u}}{dt} = -\frac{\mu\bar{r}}{r^3} + \bar{\Phi}(\bar{r}, \bar{u}, t). \qquad (1)$$

Here $\bar{r}$ is the radius-vector of a mass point, $\bar{u}$ is its velocity, $-u\bar{r}/r^3$ is the Newtonian gravitational acceleration towards the fixed centre and $\bar{\Phi}$ is the perturbation. The basic problem solved is the separation of the solution into two parts, namely the "Keplerian" part and the "perturbation". The equations of motion in the absence of the perturbation are

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$$\frac{d\bar{r}}{dt} = \bar{u}; \quad \frac{d\bar{u}}{dt} = -\frac{\mu\bar{r}}{dt} \tag{2}$$

and their solution is

$$\bar{r} = \bar{R}(\bar{r}_0, \bar{u}_0, t); \quad \bar{R}(\bar{r}_0, \bar{u}_0, 0) = \bar{r}_0,$$
$$\bar{u} = \bar{U}(\bar{r}_0, \bar{u}_0, t); \quad \bar{U}(\bar{r}_0, \bar{u}_0, 0) = \bar{u}_0, \tag{3}$$

Using the notation

the following theorem is established. In the region G of phase space in which $\bar{r} \times \bar{u} \neq 0$ and the vector function $\bar{\Phi}(\bar{r}, \bar{u}, t)$ and its first partial derivatives are continuous, the system of equations given by Eq.(1) is equivalent to the system of integral equations

$$\bar{r} = \bar{r}_0 + \int_{t_0} \bar{u}(s)\,ds \tag{4}$$

$$\bar{u} = \bar{U}(\bar{r}_0, \bar{u}_0, t - t_0) + \int_{t_0} A(\bar{r}(s), \bar{u}(s), t - s)\,\bar{\Phi}(\bar{r}(s), \bar{u}(s), s)\,ds.$$

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S/033/61/038/004/008/010
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AUTHOR: Alekseyev, V.M.

TITLE: On the theory of perturbed motion

PERIODICAL: Astronomicheskiy zhurnal, v.38, no.4, 1961, 726-737

TEXT: The author discusses the motion of a mass point in a central Newtonian field which is subject to perturbations. If the perturbations are small, then the problem can be solved by the method of successive approximations. Usually the solution is obtained in the form of a power series. In a previous paper (Ref.1: Astron.zh., 38, 325, 1961) the author showed that in the region where $\bar{r} \times \bar{u} \neq 0$ and $\bar{\Phi}$ is a continuous and differentiable function, the set of differential equations

$$\frac{d\bar{r}}{dt} = \bar{u}; \qquad \text{(A)}$$

$$\frac{d\bar{u}}{dt} = -\frac{\mu\bar{r}}{r^3} + \bar{\Phi}(\bar{r}, \bar{u}, t)$$

is equivalent to the integral equations

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$$\bar{u} = \bar{U}_\mu(\bar{r}_o, \bar{u}_o, t - t_o) + \int_{t_o}^{t} A_\mu(\bar{r}(s), \bar{u}(s), t - s)\, \bar{g}(\bar{r}(s), \bar{u}(s), s)\, ds, \quad (B)$$

where $\bar{U}_\mu(\bar{r}, \bar{u}, \tau)$ is the velocity of the unperturbed Keplerian motion at the time τ, the initial values at $\tau = 0$ being $\bar{r}_o$, $\bar{u}_o$, and $A_\mu = \partial\bar{U}_\mu/\partial\bar{u}$ is a matrix made up of the derivatives of the components $\bar{U}_\mu$ with respect to the components of the initial velocity. The present paper is concerned with the perturbed Keplerian motion which is described by (B). The analysis is carried out in a seven-dimensional space $\mathfrak{X}(\bar{r}, \bar{u}, t)$. The following theorem is proved:

Theorem 1. If $\{\bar{r}(t), \bar{u}(t)\}$ is a solution of (A) in the range $[0, T]$ and if, moreover:

1) D is an open domain of $\mathfrak{X}$,

2) the function $\bar{g}(\bar{r}, \bar{u}, t)$ and its first order partial derivatives are continuous in D and $\bar{r} \times \bar{u} \neq 0$,

3) provided that $(\bar{r}, \bar{u}, s) \in D$ and $t \in (s, T)$, the condition

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$$\| A(\bar{r},\bar{u},t - s) \| \leqslant M(t,s), \quad | \bar{\Phi} (\bar{r},\bar{u},s) | \leqslant \varphi(s);$$

is satisfied and 4) there exists $t' > t_o$ such that the curve $[\bar{r}(t), \bar{u}(t), t]$ lies in D in the range (t_o, t'), then in the range (t_o, T)

$$\Delta u = | \bar{u}(t) - \bar{U}(\bar{r}_o,\bar{u}_o,t - t_o) | \leqslant \int_{t_o}^{t} M(t,s)\varphi(s)\, ds \tag{1.1}$$

$$\Delta r = \left| \bar{r}(t) - \bar{r}_o - \int_{t_o}^{t} \bar{U}(\bar{r}_o,\bar{u}_o, s - t_o) ds \right| \leqslant \int_{t_o}^{t} \int_{t_o}^{s} M(s,\sigma)\varphi(\sigma) d\sigma\, ds$$

provided that any solution of (A) which satisfies (1.1) in the range (t_o, τ) belongs to D at the instant τ. A similar problem has been discussed by G. A. Merman (Ref.2: Byull.ITA, 6:2(75)73-84, 1959).

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The next theorem which is proved is the following:

Theorem 2. If

1) D is an open domain in the 13-dimensional space $(\bar{r}, \bar{u}, \bar{\rho}, \bar{w}, t)$,

2) at all points in D
$\bar{r} \times \bar{u} \neq 0$, $\bar{\rho} \times \bar{w} \neq 0^{*}$, $r_{02}^2 + r_{12}^2 > 0$;

3) at all points in D

$$\| A_{\mu}(\bar{r}, \bar{u}, t - s) \| \leqslant M_1(t, s) \text{ for } t \in (s, T)$$

$$\| A_{\lambda}(\bar{\rho}, \bar{u}, t - s) \| \leqslant M_2(t, s) \text{ for } t \in (s, T)$$

$$| \bar{\xi} (\bar{r}, \bar{\rho}) | \leqslant \varphi(s) \qquad | \bar{\psi} (\bar{r}, \bar{\rho}) | \leqslant \Psi(s);$$

4) there exists $t' < t_0$ such that $(\bar{r}(t), \bar{u}(t), \bar{\rho}(t), \bar{w}(t), t) \in D$ for $t \in (t_0, t')$;

then

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$$\Delta r = \left| \bar{r}(t) - \bar{r}_o - \int_{t_o}^{t} \bar{U}_\mu (\bar{r}_o, \bar{u}_o, s-t_o) ds \right| \leqslant \int_{t_o}^{t} \int_{t_o}^{s} M(s,\sigma)\varphi(\sigma) d\sigma\, ds,$$

$$\Delta u = \left| \bar{u}(t) - \bar{U}_\mu(\bar{r}_o, \bar{u}_o, t-t_o) \right| \leqslant \int_{t_o}^{t} M_1(t,s)\varphi(s) ds \qquad (1.4)$$

$$\Delta \rho = \left| \bar{\rho}(t) - \bar{\rho}_o - \int_{t_o}^{t} \bar{U}_\lambda(\bar{\rho}_o, \bar{w}_o, s - t_o) ds \right| \leqslant \int_{t_o}^{t} \int_{t_o}^{s} M_2(s,\sigma)\varphi(\sigma) d\sigma\, ds$$

$$\Delta w = \left| \bar{w}(t) - \bar{U}_\lambda(\bar{\rho}_o, \bar{w}_o, t - t_o) \right| \leqslant \int_{t_o}^{t} M_2(t,s)\, ds$$

provided that any solution $(\bar{r}, (t), \bar{u}(t), \bar{\rho}(t), \bar{w}(t))$ of

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$$\frac{d\bar{r}}{dt} = \bar{u}; \quad \frac{d\bar{u}}{dt} = -\frac{\mu\bar{r}}{r^3} + \gamma m_2\left[\frac{\bar{r}_{12}}{r_{12}^3} - \frac{\bar{r}_{02}}{r_{02}^3}\right] = -\frac{\mu\bar{r}}{r^3} + \bar{\Phi}$$

$$\frac{d\bar{\rho}}{dt} = \bar{w}; \quad \frac{d\bar{w}}{dt} = -\frac{\lambda\bar{\rho}}{\rho^3} + \frac{m_o}{m_o + m_1}\left[\frac{\gamma(m_o + m_1 + m_2)}{r_{20}^3}\bar{r}_{20} + \frac{\lambda\bar{\rho}}{\rho^3}\right] +$$

$$+ \frac{m_1}{m_o + m_1}\left[\frac{\gamma(m_o + m_1 + m_2)}{r_{21}^3}\bar{r}_{21} + \frac{\lambda\bar{\rho}}{\rho^3}\right] = -\frac{\lambda\bar{\rho}}{\rho^3} + \bar{\Psi}, \quad (1.2)$$

which satisfies the conditions given by (1.4) in the range (t_o, τ) belongs to D at the instant τ ($\bar{\rho}$ is the vector connecting the centre of the body with the centre of mass of the bodies P_o and P_1, P_i being the i-th body; $\bar{w} = d\bar{\rho}/dt$). Theorem 2 can then be specialised to estimate the hyperbolic approach of two bodies and
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to construct a fairly general class of examples of capture in the problem of three bodies (this will be discussed in subsequent papers). The final theorem proved in this paper gives an estimate for the interval in which there exists a solution of (A) and the errors by which the successive approximations differ from the true solution, i.e. it is concerned with the convergence of the successive approximations. There are 4 Soviet references.

ASSOCIATION: Gosudarstvennyy Astronomicheskiy in-t im. P. K. Shternberga (State Astronomical Institute imeni P. K. Shternberg)

SUBMITTED: July 11, 1960

Card 7/7

32436

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S/033/61/038/006/005/007
E161/E435

AUTHOR: Alekseyev, V.M.

TITLE: An estimate of perturbations of hyperbolic motion in the 3-body problem

PERIODICAL: Astronomicheskiy zhurnal, v.38, no.6, 1961, 1099-1113

TEXT: Two gravitating point-particles of mass attracting each other according to Newton's law $\gamma m_1 m_2/r^2$ normally move relative to each other along paths which are either ellipses, hyperbolas or parabolas. Such a movement is defined in this paper as "unperturbed" motion. The approach of a third particle is liable to upset the stability of this system, resulting in a "perturbed" motion. The present author attempts in this paper to estimate the magnitude of the effect of such an approach and, in particular, the perturbations that occur in all the variables that characterize the system. Past efforts to solve this problem have usually resulted in the need for carrying out unwieldy computations. The method herein developed is considered simpler, equally applicable to both elliptic and hyperbolic unperturbed motion and allows of generalization to attractive forces of an arbitrary nature. The development of the theory is restricted to

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the case where the unperturbed motion is hyperbolic, with the additional condition of convenience that at $t = 0$ the distance between the two principal bodies is a minimum or has a positive derivative. The greater part of the paper comprises the formulation and proof of eight lemmas and two theorems. These are preliminary results, mostly inequalities, which are required in the subsequent estimates. These estimates are of the perturbations in the distance r between the two principal bodies, in the rate of increase u of this distance, in the distance ρ of the third body from the centre of mass of the two principal bodies, in the rate of change w of this latter distance. These pertubations are given in quite general form and a specific example is worked out in which the various parameters are given numerical values. G.A.Merman is mentioned in connection with his work in this field. There are 8 Soviet-bloc references.

[Abstractor's note: The paper contains a number of disconcerting printing errors.]

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32436

An estimate of perturbations of ... S/033/61/038/006/005/007
E161/E435

ASSOCIATION: Gos. astronomicheskiy in-t im. P.K.Shternberga
(State Astronomical Institute im. P.K.Shternberg)

SUBMITTED: November 21, 1960

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20830

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S/055/62/000/004/001/004
I027/I227

AUTHOR: Alekseyev, V. M.

TITLE: On a problem with small parameter

PERIODICAL: Moscow Universitet. Vestnik, Seriya 1, Matematika, mechanika, no. 4, 1962, 17-27

TEXT: The author investigates systems of differential equations with non-uniformly small parameter μ, which arise e.g. in shock theory. The particular application given there is the 3 bodies problem with masses $m_i \ll m_0$, $i = 1,2$ and the distance between m_1, m_2 tending to 0. The small "non-uniform" perturbation is here the mutual attraction of between the small bodies. Let x, ξ, X_1, X_2 denote n-dimensional vectors, y, η, Y_1, Y_2 m-dimensional vectors. $v^{(i)}$ is the i-th component of the vector v, and $\|v\|^2 = \sum_i v^{(i)2}$. The system considered is:

$$\frac{dx}{dt} = X_1\left(\frac{x}{\mu}, y, \mu\right) + X_2(x, y, \mu); \quad \frac{dy}{dt} = \frac{1}{\mu} Y_1\left(\frac{x}{\mu}, y, \mu\right) + Y_2(x, y, \mu) \qquad (1)$$

It is assumed that for $\|\xi\| > M_1$, $\mu < \mu_0''$, $|X_1^{(i)}(\xi, \eta, \mu)| < \phi(\|\xi\|)$, $Y_1^{(i)}(\xi, \eta, \mu) < \psi(\|\xi\|)$ with ϕ, ψ monotonic, $\phi(\alpha) \to 0$ as $\alpha \to \infty$ and $\psi(\alpha)$ summable in (M_1, ∞). These condition assure that the perturbation X_1, Y_1/μ have the "non-uniformly" small character. Under supplementary conditions it is proved that the solution

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3.1400

AUTHOR: Alekseyev, V.M.

TITLE: New examples of capture in the three-body problem

PERIODICAL: Astronomicheskiy zhurnal, v.39, no.4, 1962, 724-735

TEXT: In previous papers (Astron.zh., 38, 1961, *325; Ibid, †726; Ibid, 1099) the author put forward a method for estimating the departure of perturbed motion from unperturbed motion. This method is said to be simpler than that developed by G. A. Merman and N. G. Kochina (Byull. In-ta teor.astron.AN SSSR, 6, 1955, 75; Ibid, 79). In the present paper, where this approach is used to set up new examples of capture in the problem of three bodies, the basic idea is similar to that used by K. A. Sitnikov (Matem.sb., 32 (74), 693, 1953), i.e. all the bodies are assumed to move with large velocities. However, the three mass points are assumed to have different masses and the maximum number of free parameters is employed, which cannot be done by directly generalizing the method used by Sitnikov. Two cases are distinguished, namely, the "real system" in which all three bodies interact with each other in accordance with Newton's

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law of gravitation and the "ideal system" in which only two of the three bodies interact and the third is free (the so-called intermediate system, with collision allowed). The possibility of capture is demonstrated in a number of special cases without recourse to numerical integration.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University)

SUBMITTED: February 27, 1961

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S/033/62/039/006/020/024
E032/E514

AUTHOR: Alekseyev, V.M.

TITLE: An example of exchange in the problem of three bodies with a negative energy constant

PERIODICAL: Astronomicheskiy zhurnal, v.39, no.6, 1962, 1102-1111

TEXT: A special case of the motion of three gravitating mass points is discussed. It exhibits the so-called "exchange" which is defined as having the following property: 1) when $t \to +\infty$ the distance P_0P_1 is finite and the distances P_0P_2 and P_1P_2 tend to infinity and 2) when $t \to -\infty$ the distance P_0P_2 is finite and the distance P_0P_1 and P_1P_2 tend to infinity. There is thus a change in the class of hyperbolic elliptical motion and this is in contradiction with the lemma of J. Chazy (J. Math. pures et appl., 8, 353, 1929), according to which the class of hyperbolic-elliptical motion cannot change between $t = -\infty$ and $t = +\infty$. The example is specified as follows. At the initial time $t = 0$ the coordinates and velocities of the three bodies are given by

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$$\underline{r}_o(0) = \left\{0, \frac{-4m}{1+2m}, 0\right\}; \quad \underline{r}_1(0) = \left\{-\frac{m}{2}, \frac{2}{1+2m}, 0\right\};$$

$$\underline{r}_2(0) = \left\{\frac{m}{2}, \frac{2}{1+2m}, 0\right\}; \quad \underline{v}_o(0) = \left\{\frac{-1.4m}{1+2m}, 0, 0\right\}; \qquad (1)$$

$$\underline{v}_1(0) = \left\{\frac{-0.7}{1+m}, -\frac{\sqrt{6}}{2}, 0\right\}; \quad \underline{v}_1(0) = \left\{\frac{0.7}{1+m}, \frac{\sqrt{6}}{2}, 0\right\}$$

where $\underline{r}_i$ is the position vector of P_i, $\underline{v}_i$ is its velocity, $\underline{r}_{ij} = \underline{r}_i - \underline{r}_j$, $r_{ij} = |\underline{r}_i - \underline{r}_j|$, the gravitational constant and the mass of P_o are taken to be unity and the masses of P_1 and P_2 are assumed to be each equal to m. The problem is therefore a two-dimensional one. It is then shown that: 1) the centre of gravity is at rest at the origin, 2) the total energy is given by

$$H = \frac{v_o^2}{2} + \frac{m}{2}(v_1^2 + v_2^2) - \frac{m^2}{r_{12}} - \frac{m}{r_{01}} - \frac{m}{r_{02}} = m\left\{\frac{1}{2} + \frac{0.49}{1+2m} - \frac{1}{\sqrt{1+(m/4)^2}}\right\}$$

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so that $H = m(-0.01 \pm 0.98\ m)$. (2)

and 3) the area integral is given by

$$C = \sum_{i=0}^{2} m_i (x_i y_{y,i} - y_i v_{x,i}) = -\frac{2.8m}{1 + 2m} + \frac{m^2\sqrt{6}}{2}$$

and hence $C = m(-2.8 \pm 6.83\ m)$ (3)

It is established that if $m \leqslant 10^{-5}$, then subject to the initial conditions given by Eq.(1), the phenomenon of "exchange" will occur.

SUBMITTED: February 27, 1961

ALEKSEYEV, V.M.

Generalized three-dimensional problem of two fixed centers. Classification of the motions involved. Biul Inst. teor. astron. 10 no.4:241-271 '65. (MIRA 18:9)

ALEKSEYEV, V.M. (Moskva)

Theorem on integral inequalities and some of its applications. (MIRA 18:10)
Mat. sbor. 68 no.2:251-273 O '65.

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000100930003-5"

L 47195-66 EWP(m)/EWT(l) GW

ACC NR: AR6021903 SOURCE CODE: UR/0313/66/000/003/0021/0021

AUTHOR: Alekseyev, V. M.

24
B

TITLE: Generalized space problem of two stationary centers. Classification of motion

SOURCE: Ref. zh. Issl kosm prostr, Abs. 3.62.194

REF SOURCE: Byul. In-ta teor. astron. AN SSSR, v. 10, no. 4, 1965, 241-271

TOPIC TAGS: motion equation, artificial satellite motion equation, motion analysis, motion classification

ABSTRACT: A quadratic integration is effected for equations of motion for a material point in a field of Newtonian attraction of two stationary centers. During the last few years, this classical problem has aroused increasing interest, since it was shown that one of the forms of the problem of two stationary centers is a good approximation of the motion of an artificial earth satellite within the gravity field of a flattened spheroid. The problem of two stationary centers falls within the Liuville group. Here a qualitative analysis and a classification of motion is effected by using a method applied to all instances of Liuville integrations. All possible combinations of masses—positive, negative, complex—corresponding to a material potential, are analyzed. The author limits himself to the interpolation and classification only of possible types of motion. N. Yakhontova. [Translation of abstract] [SP]

SUB CODE: 12, 20, 22/

Card 1/1 pb

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ACC NR: AR6021874

of two stationary centers were carried out according to a method applicable to any case of Liouville integrability. All instances of space motion were analyzed for all possible combinations of masses, i.e., positive, negative, and complex, which correspond to a real potential; however, the author limits himself by introducing only the types of motion and their classification. Orig. art. has: a bibliography of 10 reference items. N. Yakhontova. [Translation of abstract.] [AM]

SUB CODE: 20, 22, 03/

hs

Card 2/2

L 20944-66
ACC NR: AP6007600 (A) SOURCE CODE: UR/0256/66/000/002/0041/0042

AUTHOR: Alekseyev, V. M. (Lieutenant colonel)

ORG: None

TITLE: Preparing airdromes

SOURCE: Vestnik protivovozdushnoy oborony, no. 2, 1966, 41-42

TOPIC TAGS: military airfield, runway construction, airfield clearing

ABSTRACT: The experience acquired by a military unit in preparing and constructing field airdromes in winter is discussed. The airdromes were located mostly in marshy woodland with sand soils covered with snow 1 m thick at temperatures of 40 to 48 C below zero. The snow was cleared away by using tractors equipped with small snowplows or snow-scrapers. Rotary snowplows of D-470 type were also used. However, about twelve hours were needed to make them ready for operation. The experience showed that it was more advantageous to first clear a 30-m wide area stretching along both sides of the proposed landing strip. Then, the snow remaining on the strip was pushed aside by the D-470 snowplow moving at a rate of 15 to 18 km per day. Two or three runs were needed to complete the clearing. Due to the presence of sand particles in the lower snow layers, the rotor blades and screws often were

Card 1/2

ACC NR: AP6007600

worn out after one day of operation. The compaction of lower layers by rollers did not produce a desired effect. The best method was to remove the snow completely from the airstrip by means of D-470 snowplows equipped with reinforced blades and screws (a 3-mm steel was used instead of 2-mm). In order to diminish the area of snow clearing, the same runways were used for landing and takeoff. Arrangements also were made to use them for parking purposes. Difficulties encountered with starting snowplow and tractor engines at low freezing temperatures were briefly examined and additional measures were recommended.

SUB CODE: 01 / SUBM DATE: None / ORIG REF: 000 / OTH REF: 000

Card 2/2 MGS

ACC NR: AR6019469 SOURCE CODE: UR/0269/66/000/002/0010/0010

AUTHOR: Alekseyev, V. M.

TITLE: Generalized space problem of two fixed centers. Classification of motions

SOURCE: Ref. zh. Astronomiya, Abs. 2.51.90

REF SOURCE: Byul. In-ta teor. astron. AN SSSR, v. 10, no. 4, 1965, 241-271

TOPIC TAGS: satellite motion, mathematic analysis, integration

ABSTRACT: The equation of the movement of a material point in the field of Newtonian attraction is integratable in squares. This problem has acquired a special interest during recent years because it was found that one of the variations of the problem of two fixed centers well approximated the problem of the motion of a satellite in the attraction field of an oblate spheroid. The problem of two fixed centers is one of the Luiville problems. The qualitative analysis and the classification of the types of motion in this problem were made by a method applicable to any case of integrability by Luiville. A study was made of all cases of space motion applicable to all possible combinations of masses corresponding to the real potential: positive, negative. and complex. The author limited himself to a discussion of the possible types of motions and their classification. Bibliography of 10 titles. N. Yakhontova. [Translation of abstract]

SUB CODE: 22, 12 UDC: 521.4

Card 1/1

USSR/Human and Animal Physiology. The Nervous System T-12

Abs Jour : Ref Zhur - Biol., No 14, 1958, No 65750

Author : Alekseyev V.M.
Inst : The Ivanovo Medical Institute
Title : The Change in Conditioned Defensive Reflexes Associated with Burn Shock and Its Treatment

Orig Pub : Sb. nauchn. tr. Ivanovsk. med. in-ta, 1957, Vyp. 12, 194-200

Abstract : No abstract

Card : 1/1

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[Marine shaft-driven generators] Sudovye valogeneratory. Leningrad, Sudostroenie, 1965. 236 p. (MIRA 18:4)