

Ideal magnetisation curves of ...

30172
S/139/61/000/005/009/014
E194/E135

magnetisation in neighbouring domains. Temperature variations with simultaneous application of a direct magnetic field can give hysteresisless magnetisation curves: however, usually these do not coincide with one another. When uniform mechanical stress is applied, the hysteresis curves obtained by different methods coincide in the limit.

There are 5 figures, 1 table and 22 references: 12 Soviet-bloc, 1 Russian translation from non-Soviet publication, and 9 non-Soviet-bloc. The English language references read as follows:
Ref.2: J. Ewing, Trans. Roy. Soc., Vol.1, 564, 1885.
Ref.9: J.R. Ashworth, Ferromagnetism, London, 1938.

ASSOCIATION: Institut fiziki SO AN SSSR
(Institute of Physics, SO AS USSR)
Krasnoyarskiy pedinstitut
(Krasnoyarsk Pedagogical Institute)

SUBMITTED: August 1, 1960

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S/137/62/000/003/104/191
A060/A101

AUTHORS: Drokin, A. I., Cherkashin, V. S., Smolin, R. P.

TITLE: Influence of ultrasound upon the irreversible processes of magnetization in single-crystalline nickel

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 3, 1962,5, abstract 3I28
(V sb. "Primeneniye ul'traakust. k issled. veshchestva". no. 13, Moscow, 1961, 181-187)

TEXT:1 The thermomagnetic hysteresis was investigated upon samples of single-crystalline Ni in various orientations with respect to the rolling. Specimens were fabricated by a multiple rolling with reduction by 90%. Rods with rectangular cross-section were cut out of the rolled strip along the direction of rolling, at an angle of 45° , and transversely to the direction of rolling, and then annealed in vacuum at $1,150^{\circ}$ and soaked at that temperature for 5 hours and thereupon cooled together with the furnace. By using this method it was not arrived at a total recrystallization of the specimens. A "cubic texture" was manifested in the specimens after the annealing. The specimens were irradiated by ultrasonic waves with a frequency of 20 kc/s. The thermomagnetic hysteresis

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A060/A101

Influence of ultrasound ...

of the specimens was measured by an astatic magnetometer using the cycle heating - cooling in the temperature range from room temperature to the Curie point. It was established that the increase of magnetization for specimens cut out at various angles to the direction of rolling increases as the field increases. It attains a maximum at a field intensity close to the coercive force, then decreases smoothly, becoming slight at a field intensity of 20 oersteds for specimens cut out across and along the direction of rolling; for specimens cut out at an angle of 45° to the direction of rolling the increment of magnetization decreases somewhat more slowly. Under the action of ultrasonic vibration and cyclic heating and cooling there occurs an irreversible increase in the magnetization proceeding in fields at which the magnetization is realized on account of irreversible displacements of the interdomain boundaries. However, the values of this increase differ for one and the same field intensity. At higher field intensities the ultrasound yields a greater increase of magnetization.

A. Rusakov

[Abstracter's note: Complete translation]

Card 2/2

38762

S/194/62/000/005/074/157
D222/D308

24.2200

AUTHORS: Drokin, A.I., Cherkashin, V.S., and Smolin, R.P.

TITLE: The influence of ultrasound on the irreversible processes of magnetization in monocrystalline nickel

PERIODICAL: Referativnyy zhurnal. Avtomatika i radioelektronika, no. 5, 1962, abstract 5-5-32 c (V. sb. Primeneniye al'traakust. k issled. veshchestva, no. 13, M., 1961, 181-187)

TEXT: The influence of ultrasounds on ferromagnetics was studied with monocrystalline nickel specimens obtained by N.A. Bryukhatov and G.P. D'yakov (Primeneniye ul'traakust. k issled. veshchestva, no. VII, izd. MOPI, M., 1958) by the method of cold rolling with 90 % reduction and subsequent heating at a temperature of 1150°C for 5 hours. Specimens in the form of bars of rectangular cross-section were cut longitudinally, transversally and at an angle of 45° to the direction of rolling. It was observed that the irreversible growth of magnetization under the influence of ultrasound, and due to thermal vibration, occurs in the region of maximal magne-
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The influence of ultrasound on the ...

S/194/62/000/005/074/157
D222/D308

tic permeability. In fields of 0-5 Oe, thermal vibration gives a great increase, and in fields beyond 5 Oe the ultrasound has the greater effect. The magnetization increment curves have a maximum at lower fields, near the coercive force, then slowly decline, becoming negligible towards 20 Oe. For specimens cut at 45°, the maximum is below the others and the decline in the increment is slower. This is explained by the course of the magnetostriction curves as functions of the field. 3 figures. 9 references. [Abstractor's note: Complete translation].

X

Card 2/2

20133

S/181/61/003/002/031/050
B102/B201

9.4300 (and 1147, 1158)

AUTHORS: Drokin, A. I., Dylgerov, V. D., and Zolotarev, Yu. M.

TITLE: Dynamics of powder patterns on magnesium-manganese-ferrite single crystals

PERIODICAL: Fizika tverdogo tela, v. 3, no. 2, 1961, 553-557

TEXT: Results obtained from studies of the domain structure of magnesium-manganese-ferrite single crystals with a rectangular hysteresis loop are offered within the framework of the problems concerning the relationship between the form of hysteresis and the domain structure. These spinel-type single crystals were grown from a solution by A. G. Titova at the Institut poluprovodnikov AN SSSR (Institute of Semiconductors AS USSR) and had the following composition: 0.5 mole% Fe_2O_3 + 0.4 mole% MnO + 0.1 mole% MgO. The following temperature-time characteristic was followed: heating from 20 to 1370°C during three hours, holding at 1370°C during three hours, cooling to 1200°C (rate: 60°/hr), further cooling to 800°C (15°/hr). The crystals obtained were

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B102/B201

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Dynamics of powder patterns on ...

plate-shaped, 0.1-0.3 mm thick, and up to 10 mm in diameter. The single crystals displayed mirror faces, so that no polishing was necessary. The crystal orientation was determined with an X-ray apparatus of the type YPC-70 (URS-70), and the plate surface was found to be parallel to the (110)-plane (lattice constant: 8.5 Å). The magnetic suspension used was prepared in the usual manner, and the patterns obtained there-with were examined with an МБМ-6 (MBI-6) microscope. Magnetization and magnetic reversal were performed by means of a special electromagnet, with fields up to 26 oersteds. Numerous microphotographs of powder patterns are shown (not reproducible) and discussed. The following results were obtained: 1) if magnesium-manganese-ferrite single crystals are magnetized by a field in the [011] direction, the domain boundaries are displaced in the case of very weak fields only; in fields whose strength approaches the coercive force, the magnetization vectors undergo an Umklapp process into the field direction, with the form of the domain structure being essentially conserved; 2) in the magnetic reversal of single crystals by a field lying in the [011] direction, no displacement of the boundaries between the domains is observable, and there only take place Umklapp processes with the domain structure being

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Dynamics of powder patterns on ...

conserved. In fields near the coercive force, the magnetization vectors undergo an Umklapp process; 3) when single crystals undergo magnetization and magnetic reversal by fields in perpendicular to the [011] direction, a displacement of the boundaries and an Umklapp process of the magnetization vectors will be observable, while the patterns will not undergo any abrupt changes; 4) the mechanism of the processes of magnetic reversal of ferrites with rectangular hysteresis differs from that in metals. No appearance and growth of nuclei with magnetic reversal is observable on a change of direction and magnitude of the field. The rectangular shape of the hysteresis in polycrystalline ferrites can be assumed to be caused by crystals whose [011] axes lie in the field direction, and that in this connection Umklapp processes play the main role, a displacement of boundaries, however, not being excluded for the other crystals. A. G. Titova is finally thanked for having prepared the single crystals. N. S. Akulov and Ye. I. Kondorskiy are mentioned. There are 4 figures and 12 references: 9 Soviet-bloc and 2 non-Soviet-bloc.

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Dynamics of powder patterns on ...

S/181/61/003/002/031/050
B102/B201

ASSOCIATION: Institut fiziki Sibirskogo otdeleniya AN SSSR Krasnoyarsk
 (Institute of Physics of the Siberian Department of the
 AS USSR, Krasnoyarsk)

SUBMITTED: June 13, 1960

Card 4/4

24.2200
AUTHORS:

Kirenskiy, L. V., Drokin, A. I., Dylgerov, V. D., Sudakov, N. I., and Zagirova, Ye. K.

S/OAB/61/025/012/009/022
31604
B116/B138

TITLE:

Temperature dependence of the first anisotropy constant and magnetic structure of iron-manganese ferrites

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 25, no. 12, 1961, 1472 - 1476

TEXT: The temperature dependence of the first magnetic anisotropy constant K_1 of an iron-manganese ferrite single crystal was studied in the (100) plane, and its domain structure in the (110) plane. Balls 4 - 8 mm diam were made from specimens grown in a Verneuil's apparatus from $MnFe_2O_4$ with manganese excess (25% Mn_3O_4) by A. A. Popova at the Institut Kristallografi AN SSSR (Institute of Crystallography AS USSR). To find $\tau(T)$ the torques acting on the specimen in a uniform magnetic field were measured on an Akulov anisometer with a slightly modified strain gage element, $\leq 2\%$. Torque curves were first recorded in

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different fields at room and oxygen temperatures, as a function of the angle between the direction of field and the [100] axis. Then the continuous variation in maximum torque in the (100) plane was examined in the temperature range -183° - $+300^{\circ}$ - -183° . A field strength of 5100 produced saturation. Powder patterns were produced by W. S. Elmore's method (Ref.11, see below). The graphs show that at 22°K torque is nearly zero in fields of up to 750 oe. Between 750 and 1000 oe it increases, reaching $0.71 \cdot 10^{-4}$ erg.cm $^{-3}$, after which it remains constant. In fields of up to 3000 oe there was a sharp increase at the temperature of boiling oxygen. The linearity of $K_1 = f(T^2)$ means that the Bryukhatov-Kirenskiy law holds for this type of crystal also. Extrapolation to absolute zero yielded $K_0 = 17 \cdot 10^4$ erg.cm $^{-3}$. The nature of a domain structure is found to be dependant on the direction of demagnetization. With demagnetization in the [110] direction, the powder patterns in the (110) plane form thick, parallel lines perpendicular to one of the axes of easy magnetization. A secondary, wedge-shaped structure between the principal lines, indicates that the surface deviates slightly from the (110) plane. Domain structure remains constant under magnetization in the [110] direction up to 400 oe; up to 600 oe only the secondary structure is changed. Between 750 and

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1000 oe new boundaries are formed perpendicular to the second direction of easy magnetization, with another wedge-shaped secondary structure between them. Around 1000 oe, the formation of new boundaries ceases and the old ones practically disappear. The new boundaries disappear at about 1300 oe. However, new boundaries are not formed everywhere, and, where this has not occurred, the initial domain structure will reappear after demagnetization in the [110] direction. The structure remains unchanged up to 723 oe and disappears at 1300 oe. No boundaries shifts are observed. Comparing variations in torque and domain structure with the field increase, it is concluded that the greatest changes in domain structure occur in the same fields in which the crystal anisotropy increases most strongly. Papers by T. M. Perekalina, A. A. Askochenskiy (Ref.3; stat'ya v sb.: Ferrity. Izd. AN BSSR, Minsk, 1960), Ye. A. Turov and A. I. Mitsek (Ref.10; stat'ya v sb.: Ferrity. Izd. AN BSSR, Minsk, 1960) are mentioned. There are 4 figures and 11 references: 6 Soviet and 5 non-Soviet. The four most recent references to English-language publications read as follows: Ref. 1: Bozorth, R. M., Tilden, E. F., Williams, A. J., Phys. Rev., 99, 6, 178 (1955); Ref. 2: Bickford, L. R., Phys. Rev., 78, 449 (1950); Ref. 4: Bates, L. F., Craik, D. J., Griffiths, P. M., Isaac, E. D., Proc. Roy. Soc., A 253, 1

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Temperature dependence of the first....

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(1959); Ref. 5: Smith, A. W., Williams, G. W., Canad. J. Phys., 38, 9, 1187
(1960).

ASSOCIATION: Institut fiziki Sibirskogo otdeleniya Akademii nauk SSSR
(Institute of Physics of the Siberian Department of the
Academy of Sciences USSR), Institut tsvetnykh metallov im.
M. I. Kalinina (Institute of Nonferrous Metals imeni M. I.
Kalinin), Krasnoyarskiy pedagogicheskiy institut (Krasnoyarsk
Pedagogical Institute)

Card 4/4

24.7000
AUTHORS:
TITLE:

36382
S/070/62/007/003/022/026
E132/E460
Drokin, A.I., Dylgerov, V.D., Beznosikov, B.V.

PERIODICAL: Kristallografiya, v.7, no.3, 1962, 465-468
TEXT: The domain structure of ferrite monocrystals - the yttrium, holmium, erbium and gadolinium garnets
Crystals of the yttrium iron garnet type when grown in medium viscosity melts with a cooling rate of 2 to 3°/hour are isometric with the faces {110} or {110} and {211}. In more viscous melts the crystals are elongated with the forms {211} and {110}. The domain structure in the isometric crystals has been studied but not so far that of the elongated crystals. Reports of the form {321} for the latter appear to be incorrect. The domain structure and its movements in a magnetic field have now been studied for the Y, Ho, Er and Gd iron garnets. Crystals were 4 to 7 mm long. The domain structure was disclosed by powder figures. Microphotographs are reproduced for the Y, Ho, Er and Gd iron garnets the fields necessary to produce non-domain structures were found to be respectively 75 and 90 Oe. There are 5 figures.

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E132/E460

The domain structure ...

ASSOCIATION: Institut fiziki Sibirskogo otdeleniya AN SSSR
(Institute of Physics of the Siberian Section AS USSR) ✓

SUBMITTED: August 26, 1961

Card 2/2

31176

S/048/62/026/002/025/032
B117/B138

24.2200 (1147, 1164, 1482)

AUTHORS: Drokin, A. I., Cherkashin, V. S., Smolin, R. P., and
Yershov, R. Ia.

TITLE: Anhyseretic magnetization curves of ferromagnetic metals
and alloys

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya,
v. 26, no. 2, 1962, 291-295

TEXT: This paper was presented at a conference on magnetism and antiferro-
magnetism. The authors studied anhyseretic magnetization curves
obtained by different methods, and examined the possibility of obtaining
an ideal curve with the aid of a circulating variable field. 2 groups of
specimens were used (1st group: 99.91 % Ni; 96.92 % Ni; 3 % Cr; 90 % Ni,
10 % Cu, 99.32 % Ni. 2nd group: nickel, alloy steel 37XC (37KhS) and
iron with 0.07 % C). The authors chose specimens with quite wide
hysteresis loops and fairly low Curie points. The measurements (maximum
error 5 %) were made with a vertical astatic magnetometer. In the first
group anhyseretic curves were studied which had been obtained by
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Anhyseteric magnetization curves...

mechanical (sonic irradiation at 20.5 Kcps) and thermal "shaking", and with a longitudinal variable field with vanishing amplitude. Mechanical shaking at low frequencies (50 cps) and periodic tapping in a magnetic field produced no anhyseteric curves. The second group was used to study magnetization of longitudinal and circulating variable fields. The curves obtained for a specimen heated above the Curie point and then cooled to the original temperature are very close to the theoretically ideal one. It was found experimentally that the anhyseteric curves will converge under uniform and increasing load not exceeding the elastic limit. At 24 kg/mm^2 (max. load) they coincide. The almost complete coincidence of all curves at the beginning indicates that, with regard to the circulation field, the remanence becomes more stable as the H_c of the specimen rises. Up to $H_{am} = H_c$, I_r changes linearly with field. If a circulating variable field with an amplitude of $2-3 H_c$ is applied the original remanence is reduced to some per cent of its former value. Thus, such a field may prevent hysteresis. The anhyseteric curves obtained by applying a circulating a longitudinal variable field with vanishing amplitude agree satisfactorily. M. A. Grabovskiy, R. I. Yanus are mentioned. There are 5 figures, 1 table

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Anhysteretic magnetization curves...

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and 21 references: 13 Soviet and 8 non-Soviet. The three references to English-language publications read as follows: Ewing, J. Trans. Roy. Soc., 564 (1885); Ashworth, J. R. Ferromagnetism. London, 1938; Bozorth, R. Ferromagnetism, IL, M., 1956. (translation of Ferromagnetism).

ASSOCIATION: Institut fiziki Sibirskogo otdeleniya Akademii nauk SSSR
(Institute of Physics of the Siberian Department of the
Academy of Sciences USSR)

X

Card 3/3

10071

247900

S/181/62/004/000/001/045
B108/B186

AUTHORS: Drokin, A. I., Dylgerov, V. D., Sudakov, N. I., and
Starostin, I. I.

TITLE: Temperature dependence of rotary-hysteresis losses in
Mg-Mn ferrites

PERIODICAL: Fizika tverdogo tela, v. 4, no. 9, 1962, 2293-2296

TEXT: Magnetic moments and hysteresis losses of monocrystalline Mg-Mn ferrites were studied in a rotary magnetic field at various temperatures (-183° , $+22^{\circ}$, $+100^{\circ}\text{C}$) and at various field strengths (H from 700 to 4000 oe). Moment curves were found to be analogous to those of silicon iron which, like Ni and meteoritic Fe crystals, several authors have already investigated. Results: Akulov's theory was partly refuted on the ground that hysteresis losses did not drop to zero either at low (-195°) or at elevated ($500-700^{\circ}$) temperatures. Single crystals, carefully prepared by the Institut poluprovodnikov AN SSSR (Institute of Semiconductors of the AS USSR), were precisely ground to the (110) face and etched in 30-% sulfuric acid. Powder figures were observed and photographed using a M5M-6 (MBI-6) microscope. Magnetization was effected by means of a specially powerful
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Temperature dependence of ...

electromagnet with a small pole gap. High degree of rectangularity (98 %) was of special interest. While moment curves have the period π at lower H (up to 700 oe), they are characterized at higher H by the equation

$$M = \frac{K}{8} (2\sin 2\psi + 3\sin 4\psi),$$

where M - magnetic moment, ψ - the angle between the direction $[001]$ and the field. Coincidence between the direct and inverse torque occurs only at -183°C . At this temperature, Amulov's theory is valid for H up to 1500 oe. With increasing temperatures and H values, the hysteresis losses reach their maximum value at 1200 oe: at $+22^\circ\text{C}$ about $9 Q_r \cdot 10^{-2}$ erg/cm³; afterwards the curve dips slightly and increases continuously from 2000-4000 oe; at $+100^\circ\text{C}$ the peak lies approximately at $5 Q_r \cdot 10^{-2}$ erg/cm³ and drops slightly over the range of 2000-4000 oe. The losses, however, never become zero. Until now there has been no theory able to explain the existence of hysteresis losses above 1500 oe. Observation of the domain structure dynamics drew attention to strongly distorted boundaries, ascribed to strong internal stresses and nonhomogeneities. The most prominent changes in the

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B108/3186

domain structure were observed between 900 - 1000 oe of the rotary field.
There are 3 figures.

ASSOCIATION: Institut fiziki Sibirskogo otdeleniya AN SSSR Krasnoyarsk
(Physics Institute of the Siberian Department AS USSR, Kras-
noyarsk)

SUBMITTED: February 1, 1962

Card 3/3

DROKIN, A.I.; DYLGEROV, V.D.; SUDAKOV, N.I.; ZAGIROVA, Ye.K.

Losses on rotational hysteresis and dynamics of a domain structure
in rotating fields of iron-cobalt ferrate single crystals. Fiz.
met. i metalloved. 13 no.5:788-792 My '62. (MIRA 15:6)

1. Institut fiziki Sibirskogo otdeleniya AN SSSR, Krasnoyarskiy
pedagogicheskiy institut i Institut tsvetnykh metallov imeni
M.I. Kalinina.

(Ferrates—Magnetic properties)
(Domain structure)

DROKIN, A.I.; DYLGEROV, V.D.; SUDAKOV, N.I.; STAROSTIN, I.I.

Temperature dependence of rotational hysteresis losses in
magnesium-manganese ferrates. Fiz. tver. tela 4 no.9:2293-2296
S '62. (MIRA 15:9)

1. Institut fiziki Sibirskogo otdeleniya AN SSSR, Krasnoyarsk.
(Hysteresis) (Ferrates--Magnetic properties)

S/058/63/000/002/058/070
A160/A101

AUTHORS: Laptey, D. L., Cherkashin, V. S., Drokin, A. I.

TITLE: The effect of the ultrasonic action on the domain structure of iron silicide

PERIODICAL: Referativnyy zhurnal, Fizika, no. 2, 1963, 115, abstract 2E781
(In collection: "Primeneniye ul'traakust. k issled. veshchestva".
no. 15. M., 1961, 189 - 194)

TEXT: An investigation was carried out of the effect of the ultrasound and of the alternating magnetic field h on the domain structure of iron silicide in the presence of various magnetizing fields H . The observation of the domain structure was carried out by the method of Kerr's meridional magneto-optical effect. It was established that the ultrasound leads to a fractionation of the main domain structure both in the absence of the field H and in its presence. The total number of domains increases 2 - 3 times. This circumstance is explained by the fact that the magnetic energy of the sample decreases during the fractionation of the domains. The ultrasonic shaking and the "shaking" by the

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The effect of the ultrasonic action on...

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field h lead to a development of various structures. The structure obtained by the action of the ultrasound may be eliminated by a superposition of the field h , and vice versa. During an increase of the ultrasound intensity, a displacement of some boundaries takes place in the beginning - and also a simultaneous shifting of the domains on the whole. Individual domains begin to fractionate. Subsequently, this appearance intensifies and leads to the fact that the visible picture on the surface of the sample becomes washed-out.

N. Smol'kov

[Abstracter's note: Complete translation]

Card 2/2

S/139/63/000/001/008/027
E202/E420

AUTHORS: Drokin, A.I., Dylgerov, V.D.
TITLE: Domain structure of single crystals of cobalt-zinc
ferrites

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Fizika,
no.1, 1963, 39-42

TEXT: The authors studied domain structure and the change of
this structure with varying degree of strain in the spinel type of
cobalt and cobalt-zinc single crystals. The relations between
the domain structure and the field were also partially studied.
The crystals were grown from molten solvents. The composition
of the cobalt zinc ferrites was $0.5 \text{ Fe}_2\text{O}_3 \times 0.3 \text{ CoO} \times 0.2 \text{ Zn} \%$ mol.
The melt was heated to 1320°C for 2 hours and then cooled to 750°C
at 15°C per hour. The single crystals were in the shape of
platelets 3 to 4 mm and 0.7 to 1 mm thickness. X-ray methods
showed that the surface of the crystals contained the (111) plane.
The observation and photography of powder figures was carried out
using a microscope; the magnetic field was applied to the sample
by means of a special electric magnet. W.C.Elmore's method
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Domain structure of single ...

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(Phys. Rev., v.51, 1938, 1092; v.62, 1942, 468) was used to prepare the magnetic powder suspension. The surface of the crystals was highly polished and did not require any etching. In the absence of a magnetic field, powder figures showed small domains distributed in a form of 3 series of straight lines making an angle of 120° between each other. This form of powder figures was related to the crystallographic structure since the observed surface contained three principal crystallographic axes of the type $[110]$. The line series were parallel to the $[\bar{2}11]$, $[1\bar{1}\bar{2}]$ and $[1\bar{2}\bar{1}]$ axes. The application of a magnetic field parallel to $[\bar{2}11]$ changed the powder figures very little and only when the field exceeded 500 Oe were the lines parallel to the field covered by the residual series of domains. When the field disappeared the domain structure returned substantially to the original form. The domain structure on the (111) surface of a highly strained cobalt-zinc ferrite showed a large system of domains consisting of groups of parallel bands. Directions between the groups of bands were at several angles varying from 60 to 120° . It was concluded on the basis of the experiment that the domain structure of single crystals of

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Domain structure of single ...

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cobalt ferrites on the (111) surface has the form of a series of straight bands directed along $[11\bar{2}]$. On the (100) planes the bands are perpendicular to the edge of the cube. When zinc ions are added, the domain structure takes the form of a series of parallel bands of width 10 to 13 μ directed parallel to the $[\bar{2}11]$, $[11\bar{2}]$, $[1\bar{2}1]$ axes. Strained samples showed similar structure with a series of parallel domains as in the case of weakly strained samples, but the series of bands were disposed at different angles to each other, which was attributed to the deformation of the crystalline lattice. The view that cobalt and cobalt-zinc ferrites exhibit a domain structure in very high magnetic fields and exert influence on the magnetization phenomena was confirmed. There are 5 figures.

ASSOCIATION: Institut fiziki SO AN SSSR g. Krasnoyarsk
(Physical Institute SO AS USSR Krasnoyarsk)

SUBMITTED: August 28, 1961

Card 3/3

~~DROKIN, A.I.~~; DYLGEROV, V.D.; SUDAKOV, N.I.; ZAGIROVA, Ye.K.

Temperature dependence of the anisotropy constant and the magnetostriction of magnesium-manganese ferrites at indoor temperature. Izv. SO AN SSSR no.2 Ser. tekhn. nauk no.1:99-103 1963.
(MIRA 16:8)

1. Krasnoyarskiy institut fiziki Sibirskogo otdeleniya AN SSSR i Institut tsvetnykh metallov imeni M.I. Kalinina, Krasnoyarskiy pedagogicheskiy institut.
(Ferrites) (Anisotropy) (Magnetostriction)

ACCESSION NR: AP3000937

9/0139/63/000/002/0111/0111

AUTHORS: Drokin, A. I.; Dymlgerov, V. D.; Sudakov, N. I.; Vlasov, M. V.

TITLE: Dependence of rotary hysteresis loss in magnesium-manganese ferrite single crystals on the magnitude of magnetic field and temperature

SOURCE: Izv. VUZ. Fizika, No. 2, 1963, 141-144

TOPIC TAGS: magnetic hysteresis, ferrite, single crystal, mechanical moment, magnetic field

ABSTRACT: Rotary magnetic hysteresis loss has been studied on the (100) plane of magnesium-manganese ferrite single crystals, together with the dynamics of powder figures in the rotary magnetic field. The rotary loss was investigated by measuring the mechanical moment acting on single crystal ferrite pellets placed in a homogeneous magnetic field slowly rotating in forward and reverse directions. Field strength varied between 0 to 4000 oersteds at temperatures from -183 to 100C. The powder figures were photographed through a MBI-6 microscope. The results show that anisotropy in the single crystal plane (100) at 700 oersteds and up and the rotary hysteresis loss increase with increase in field strength, reaching a maximum around 900-1250 oersteds and subsequently decreasing. The authors express their gratitude

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ACCESSION NR: AP3000937

to A. G. Titova for procuring the single crystals." Orig. art. has: 4 figures.

ASSOCIATION: Institut fiziki SO AN SSSR (Institute of Physics SO AN SSSR); Institute tsvetny*kh metallov im. M. I. Kalinina Krasnoyarskiy pedinstitut (Institute of Nonferrous Metals, Krasnoyarsk Teachers Institute)

SUBMITTED: 30Jan62

DATE ACQ: 11Jun63

ENCL: 00

SUB CODE: MA

NO REF SOV: 008

OTHER: 003

Card 2/2

L 18518-63

EWT(1)/EWP(q)/EWT(m)/BJS AFFTC/ASD/ESD-3/IJP(C) JD

ACCESSION NR: AP3005309

S/0181/63/005/008/2059/2064

AUTHORS: Drokin, A. I.; Smolin, R. P.; Ryabinkina, L. I.

65
64
27

TITLE: Temperature dependence of magnetization² during heating and cooling of lithium ferrite-chromite in weak magnetic fields

SOURCE: Fizika tverdogo tela, v. 5, no. 8, 1963, 2059-2064

TOPIC TAGS: magnetization, magnetic field, ferrite, Fe, Cr, Li, O, Curie point, electrical conductivity, hysteresis, compensation, demagnetization, sublattice, ceramics

ABSTRACT: The authors have investigated thermal magnetic hysteresis and electrical conductivity in the temperature interval from 20C to the Curie point for $\text{Li}_2\text{O} \cdot 2.5 \text{Fe}_2\text{O}_3 \cdot 2.5 \text{Cr}_2\text{O}_3$ having a point of compensation. Polycrystalline samples of this material, in the form of bars 84 x 3 x 2.6 mm, were prepared by ordinary means of ceramic technology. It was discovered that the curves of temperature dependence on magnetization show characteristic features clearly emphasizing the two-sublattice structure of the ferrite. The magnetic prehistory of the samples has a marked effect on the behavior of these curves. It is possible to obtain two points of compensation artificially. The "magnetic memory" of lithium ferrite-chromite is

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L 18548-63

ACCESSION NR: AP3005309

preserved for a considerable range above the Curie point. It is necessary to heat samples at temperatures above 300C for complete demagnetization. No anomalies were observed in the electrical properties before or after the point of compensation during heating and cooling of the sample. Only magnetic transformations occurred at this point. Orig. art. has: 6 figures.

ASSOCIATION: Institut fiziki SO AN SSSR, Krasnoyarsk (Institute of Physics, Siberian Department, Academy of Sciences, SSSR)

SUBMITTED: 21Jan63

DATE ACQ: 06Sep63

ENCL: 00

SUB CODE: PH

NO REF SOV: 005

OTHER: 002

Card 2/2

S/126/63/015/001/017/029
E073/E420AUTHORS: Drokin, A.I., Dylgerov, V.D.

TITLE: Domain structure of single crystals of magnesium-manganese ferrites

PERIODICAL: Fizika metallov i metallovedeniye, v.15, no.1, 1963, 128-132

TEXT: The aim of the work was to elucidate whether it was possible to observe on various crystallographic planes of a magnesium-manganese ferrite with a rectangular hysteresis loop, a domain structure differing in shape and character and to study the dynamics of the structure during magnetization of a specimen along different crystallographic orientations. A 6 mm diameter sphere and a 1 mm thick ring with 5 mm outer and 2 mm inner diameter were cut from one single-crystal rod. Hence a chemical analysis of the composition immediately after crystallization was not required and the degree of rectilinearity of the hysteresis loop could be measured directly. The value for the rod was high, $B_r/B_s = 98.1\%$, $H_c = 0.9$ Oe. The direction of easy magnetization for the sphere coincided with the axes type $[111]$. The domain structure on the plane (100) resembled fern-patterned frost.

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Domain structure ...

S/126/63/015/001/017/029
E073/E420

reminiscent of the structure observed by L.F. Bates et al (Proc. Phys. soc., v.71, no.5, 1958, 789). The appearance of the structure depended on the direction of the AC demagnetization. With increasing fields up to 700 to 750 Oe the patterns changed only slightly but at 860 to 880 Oe there was a sudden reconstruction of the domain structure. Magnetization in the direction of the [010] caused the formation of domains in a direction approaching that of the field. The structure became "spiky" when magnetization was in the direction [011]. Further increase in the field intensity did not produce any appreciable change in the pattern. However in fields of 1250 to 1260 Oe the domain structure ceased to exist. In the plane (110) domains with strongly curved boundaries and numerous "drop-shaped" closed areas could be seen. Similar as well as other patterns could be observed in the plane (111). Here again, the domain structure changed insignificantly in weak magnetic fields but there was a radical reconstruction of the domain structure in fields of about 880 Oe and then with increasing fields the domain structure became more blurred, coarsening altogether in fields of 1000 to

Card 2/3

Domain structure ...

S/126/63/015/001/017/029
E073/E420

1260 Oe. This behaviour of the domain structure was attributed to high internal stresses and lattice nonuniformities. There are 4 figures.

ASSOCIATION: Institut fiziki SO AN SSSR
(Institute of Physics SO AS USSR)

SUBMITTED: February 6, 1962

Card 3/3

ASD(m) - j/ESD(gB)

42/0130

mandarane ferrites

Pizika. no. 5, 1964 108

mandarane ferrite mandarane s... mandarizing fac-
... ..

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ACQUISITION NR: AP4047365

telepiped 76 x 2 x 3 mm and in the form of rings. The ring dimen-

sions were either 28 mm o.d., 23 mm i.d. and 3 mm height or with

of various different diameters

ACCESSION NR AP4047365

in bulky specimens, owing to the influence of the demagnetizing ef-
The existing methods of determining the demagnetizing fac-

INSTITUTION: Institut fiziki SO AN SSSR (Institute of Physics SO
AN SSSR)

SUBMITTED: 12Dec62

ENCL: 00

BR

ACCESSION NR: APL028156

S/0181/64/006/004/1223/1227

AUTHORS: Drokin, A. I.; Laptev, D. A.; Ivanov, R. D.

TITLE: Domain structure dynamics of thin ferrite films as a function of magnetic field and temperature

SOURCE: Fizika tverdogo tela, v. 6, no. 4, 1964, 1223-1227

TOPIC TAGS: ferrite film, ferrite domain structure, magnetic field dependence, temperature dependence, Kerr magneto-optical effect, cobalt ferrite, nickel ferrite, nickel zinc ferrite

ABSTRACT: The domain structure dynamics of thin ferrite films as a function of magnetic field and temperature was investigated, using the Kerr magneto-optical effect. The films were prepared by cathode sputtering of the ferrite onto a polished quartz backing which could be heated to 1000°C. The films obtained were of the order of 1000 Å thick. The behavior of cobalt ferrite film was similar to that of nickel-zinc ferrite, both having uniaxial anisotropy. After demagnetization with a variable field decreasing smoothly to zero, domain structure was

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ACCESSION NR: AP4028456

established in the samples, indicated by the observation of light and dark bands. With increasing magnetization the light domains decreased in size until the structure completely disappeared at 33 oerst for cobalt ferrite and 110 oerst for nickel-zinc ferrite. Domain structure did not reappear with a decrease of the magnetic field to zero. Light centers of reverse magnetization began to appear at -11.6 oerst and -63 oerst respectively. With increasing reverse magnetic field the light domains grew until the domain structure disappeared at -33 oerst and -110 oerst respectively. The behavior of nickel ferrite was considerably different. Regardless of the direction of the demagnetizing field, domains were always established perpendicular to that direction. With increasing magnetic field the contrast between light and dark domains decreased, but the domain size remained fixed. This is attributed to the fact that nickel ferrite is isotropic. Hence, reverse magnetization does not occur by the shift of domain boundaries but by the rotation of the magnetization vector. Centers of reverse magnetization appeared at -60 oerst, and the domain structure completely disappeared at -100 oerst. The temperature effect on cobalt ferrite was also studied. The field at which centers of reverse magnetization appeared decreased from -11½ oerst at 0C to -7 oerst at 200C and then increased to -12½ oerst at 400C. The field at which the domain structure disappeared decreased very gradually from -33 oerst at 0C to -31 oerst

Card 2/3

ACCESSION NR: AP4028456

at 400C. The remaining samples--cadmium ferrite, lithium-chromium ferrite, magnesium-manganese ferrite and zinc ferrite--were weakly magnetic. Orig. art. has: 1 table and 6 figures.

ASSOCIATION: Institut fiziki SO AN SSSR, Krasnoyarsk (Institute of Physics SO AN SSSR)

SUBMITTED: 05Aug63

DATE ACQ: 27Apr64

ENCL: 00

SUB CODE: SS,EM

NO REF SOV: 015

OTHER: 009

Card 3/3

ACCESSION NR: AP4039407

S/0070/64/009/003/0427/0428

AUTHORS: Drokin, A. I.; Beznosikov, B. V.

TITLE: Domain structure in single crystals of ferrogarnets with thulium, dysprosium, and terbium

SOURCE: Kristallografiya, v. 9, no. 3, 1964, 427-428

TOPIC TAGS: domain structure, ferrogarnet, thulium, dysprosium, terbium, temperature dependence, temperature hysteresis, magnetic field

ABSTRACT: This is a continuation of previous work on ferrogarnets with Y, Ho, Er, and Gd by V. D. Dy*lgerov and A. I. Drokin (Kristallografiya, 5, 6, 945, 1960) and A. I. Drokin, V. D. Dy*lgerov, and B. V. Beznosikov (Kristallografiya, 7, 3, 466, 1962). The crystals were grown by Nielson's method, and the domain structure was observed by the powder method. Domain structure on the (110) plane of Tm ferrogarnet is somewhat suggestive of the structure of Gd ferrogarnet but finer. The domains have curved boundaries, the predominant direction being parallel to the long axis of the face. A superposed magnetic field, on being increased, has little effect on the structure, but at a field of 120 oersteds the domain structure disappears. The domains in Dy and Tb ferrogarnets are coarser than in the Tm

Card 1/2

DROKIN, A.I.; SUDAKOV, N.I.; GENDELEV, S.Sh.; IZOTOVA, T.P.; RYABINKINA, L.I.

Temperature dependence of the first anisotropy constant in
single crystals of iron-nickel ferrites. Fiz. met. i
metalloved. 17 no.5:684-688 My '64. (MIRA 17:9)

1. Institut fiziki Sibirskogo otdeleniya AN SSSR.

AP4010317

S/0048/64/028/001/0178/0181

AUTHOR: Smolin, R.P.; Drokin, A.I.; Zyryanov, G.I.

TITLE: Temperature magnetic hysteresis of polycrystalline monoferrites /Report, Symposium on Questions of Ferro- and Antiferromagnetism held in Krasnoyarsk, 25 June to 7 July 1962/

SOURCE: AN SSSR, Izvestiya, Seriya fizicheskaya, v.28, no.1, 1964, 178-181

TOPIC TAGS: temperature magnetic hysteresis, monoferrite, nickel ferrite, cobalt ferrite, barium ferrite, lithium ferrite, copper ferrite, manganese ferrite, magnesium ferrite

ABSTRACT: The properties and characteristics of monoferrites, characterized by the chemical formula $MeFe_2O_4$, where Me is a divalent metal ion, are of interest not only because they are employed as such in electronic engineering, but also because these materials are used in synthesis of mixed ferrites for different special applications. The temperature dependence of their magnetic characteristics is of particular interest in view of the fact that ferrite components are frequently required to operate in a wide range of temperatures. The purpose of the present work was to

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investigate temperature magnetic hysteresis of monoferrites of different composition. Specimens were prepared with 50 mole percent Fe_2O_3 and 50 mole percent MeO , where $\text{Me} = \text{Mn, Mg, Ni, Co, Ba, Cu}$ or Li . The specimens were prepared by the usual ceramic technology in the form of $86 \times 3 \times 2 \text{ mm}^3$ rods. The values of the Curie points and coercive force in an 800 Oe field are listed in the table. Preliminary tests showed that the Zn, Cd and Ca ferrites were either nonferromagnetic or exhibited very weak magnetism so that their temperature magnetic hysteresis was not investigated. The magnetic moments of the specimens were measured on a vertical astatic magnetometer and the results were converted to obtain the specific magnetization σ in $\text{gauss cm}^3 \text{ g}^{-1}$. The results for nickel ferrite are shown in Fig.1 of the Enclosure. Analogous curves were obtained for cobalt, barium, lithium, and copper monoferrites. Analysis of the results indicates that temperature magnetic hysteresis in monoferrites is associated with the same processes as those occurring in metallic ferromagnets. In individual cases, specifically that of copper ferrite, the shape of the temperature magnetic hysteresis curve may be affected by the presence in the ferrite of different magnetic phases. Orig.art.has: 4 figures and 1 table.

ASSOCIATION: Institut fiziki Sibirskogo otdeleniya Akademii nauk SSSR (Institute of Physics, Siberian Division, Academy of Sciences, SSSR)

Card: 2/12

AP4010318

S/0048/64/028/001/0182/0186

AUTHOR: Smolin, R.P.; Drokin, A.I.; Zyr'yanov, G.I.; Ry'kov, A.S.

TITLE: Temperature magnetic hysteresis of Mg-Mn ferrites /Report, Symposium on Questions of Ferro- and Antiferromagnetism held in Krasnoyarsk, 25 June-7 July 1962/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v.28, no.1, 1964, 182-186

TOPIC TAGS: temperature magnetic hysteresis, magnesium manganese ferrite, ferrite, demagnetizing field, coercive force, grain size, hysteresis loop

ABSTRACT: Although the potential scientific and practical value of investigating temperature hysteresis of the magnetization of ferrites has been pointed out by a number of authors, so far there have been few investigations of the effect. D.A. Laptey and A.I. Drokin (Izv. VUZ, Fizika, 4, 111, 1961) investigated temperature magnetic hysteresis of nickel-zinc and manganese-zinc ferrites, but there have been no studies of the dependence of the effect on the composition, crystal structure, and other properties of ferrites. Accordingly, the present study was devoted to investigation of temperature magnetic hysteresis in polycrystalline ferrites representing various points on the MnO-MgO-Fe₂O₃ concentration triangle. In all, about 70 dif-

Card ² 1/3

AP4010318

ferent compositions were investigated. All the specimens were prepared by the usual ceramic technique and were in the form of rods of rectangular cross section measuring $2.8 \times 2.7 \times 86 \text{ mm}^3$. The measurements were carried out on a vertical astatic magnetometer. In most cases the temperature range extended from -183° to the Curie point. The results are presented in the form of curves of the specific magnetization ($\text{gauss cm}^3 \text{ g}^{-1}$) (or magnetization I) versus temperature for the full heating-cooling cycle. The effect of different factors on the shape of the curves is discussed. The following conclusions are drawn on the basis of the experimental results: 1. The reason for temperature magnetic hysteresis in Mg-Mn ferrites is irreversible domain wall motion. 2. The hysteresis decreases with increasing MnO concentration. 3. Increase of the temperature and the duration of annealing leads to decrease of the temperature magnetic hysteresis. 4. The size of the crystal grains has a significant influence on the magnetic properties of Mg-Mn ferrites: increase in the grain size leads to reduction of the hysteresis and coercive force. 5. The internal demagnetizing field has a significant influence on magnetization switching in Mg-Mn ferrites. 6. Most of the other regularities observed as regards temperature magnetic hysteresis in Mg-Mn ferrites are similar to the regularities typical of polycrystalline metals such as nickel, permalloy and work hardened Elinvar. Orig.art.has: 4 figures.

Card 2/8 *Inst. Physics Siberian Dept AS USSR*

ACCESSION NR: AP4023405

S/0048/64/028/003/0545/0552

AUTHOR: Kirenskiy, L.V.; Drokin, A.I.; Dy*lgerov, V.D.; Sudakov, N.I.; Sinegubov, V.I

TITLE: Domain structure in ferrites and its dynamics in varying and rotating magnetic fields [Report, Symposium on Ferromagnetism and Ferroelectricity held in Leningrad 30 May to 5 June 1963]

SOURCE: AN SSSR: Izvestiya. Seriya fizicheskaya, v.28, no.3, 1964, 545-552

TOPIC TAGS: ferrite, domain structure, ferrite domain structure, garnet ferrite, garnet ferrite domain structure, spinel ferrite, spinel ferrite domain structure, hexagonal ferrite domain structure, double domain structure, domain wall fine structure

ABSTRACT: The domain structure of a number of ferrite single crystals having the garnet, spinel or hexagonal structure was investigated. The powder method of W.S. Elmore (Phys.Rev.51,10,1092, 1938) was employed to reveal the domains. The polarity of the domain boundaries was determined with the aid of the polar Kerr effect, employing a previously described technique (V.D.Dy*lgerov and A.I.Drokin, Kristallografiya, 5,6,945,1960); A.I.Drokin, V.D.Dy*lgerov and B.V.Beznosikov, Ibid.9,3,465,

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ACCESSION NR: AP4023405

1962). The Yb, Ho, Er and Gd garnet ferrites were obtained as single crystals from melts. Lead hexaferrite was also prepared in this way. Crystals of Co-Fe, Mn-Fe and Mg-Mn ferrites with the spinel structure were grown in an oxy-hydrogen flame. Spheres of 4 to 8 mm diameter were obtained. These were annealed above the Curie point and oriented in a magnetic field. The planes to be investigated were ground flat, polished and treated with hot sulfuric acid to destroy surface mosaic. Lead hexaferrite was found to have a domain structure similar to that of cobalt. The ferrites with the garnet structure had very complex domain structures, for which it does not seem possible to construct a model. "Stringy" walls, double banded walls, and curved walls were observed in different materials. The curved domain walls of gadolinium ferrite garnet would shift under the influence of an applied magnetic field. The domain structure of the spinel ferrites was somewhat less complex. The presence of double domain structure was established. Successive walls would have opposite polarity, and in the presence of a gradually increasing magnetic field alternate walls would first disappear, the remaining walls disappearing only when the field became stronger. Sometimes a single domain wall would separate into two under the influence of a field; in such a case the two new walls would have the same polarity as the old, thus interrupting the regular alternation of polarity. Wide do-

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ACCESSION NR: AP4023405

main walls were observed in which a fine structure could be perceived. Such complex walls exhibited alternations of polarity, as though they were composed of several walls having opposite polarities. It is suggested that the double domain structure of ferrites may be due to the interaction between the two magnetic sublattices, each striving to establish its own domain pattern. Orig.art.has: 5 figures.

ASSOCIATION: Institut fiziki Sibirskogo otdeleniya Akademii nauk SSSR (Institute of Physics, Siberian Division, Academy of Sciences, SSSR)

SUBMITTED: OO

DATE ACQ: 10Apr64

ENCL: OO

SUB CODE: PH

NR REF SOV: 014

OTHER: 010

Card 3/3

DROKIN, A.I.; GENDELEV, S.Sh.

Domain structure in single crystals of barium and strontium hexaferrite. Izv. vys. ucheb. zav.; fiz. 8 no.2:40-42 '65. (MIRA 18:7)

1. Institut fiziki Sibirskogo otdeleniya AN SSSR.

L 1704-66 EWT(1)/EWT(m)/EWP(w)/T/EWP(t)/EED-2/EWP(b)/EWA(c) IJP(c) JD/FW

ACCESSION NR: AP5021078 ²⁹ UR/0288/65/000/002/0103/0109

AUTHOR: ^{44,55} Drokin, A. I.; ^{44,55} Sudakov, N. I.; ^{44,55} Sidorov, F. K.; ^{44,55} Yarichina, K. V.

TITLE: Magnetic crystallographic anisotropy and losses due to rotary hysteresis in single crystals of cobalt iron ferrites ^{21,44,55}

SOURCE: AN SSSR, Sibirskoye otdeleniye. Izvestiya. Seriya tekhnicheskikh nauk, no. 2, 1985, 103-109

TOPIC TAGS: magnetic anisotropy, crystal anisotropy, magnetic hysteresis, single crystal, ferrite, cobalt alloy, iron alloy

ABSTRACT: Object of the study was investigation of the temperature dependence of the anisotropic constants for single crystals of cobalt iron ferrites over a broad temperature interval, the effect of thermomagnetic treatment on the curves for the mechanical moments, and losses due to rotary hysteresis. The samples had the following composition: $(Co_{0.4}Fe_{0.15}Fe_{0.45}O_4)$ (with 1.2-1.4 mole% excess iron). To eliminate internal stresses, the samples were annealed for 24 hours at 600C with subsequent slow cooling. The constants of magnetic crystallo-

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ACCESSION NR: AP5021078

graphic anisotropy were determined by measuring the rotary mechanical moments acting on the sample in the field of a rotating electromagnet. Measurement error did not exceed 3%. Temperature interval was from the temperature of boiling oxygen to the Curie point. Losses due to rotary hysteresis were determined by planimetric measurement of the area between the curves for the mechanical moments during forward and reverse rotation of the magnetic field in the plane. Error was 6-8%. Magnetic saturation was determined by a ballistic method, and the initial magnetic permeability by the resonance method at a frequency of 10 megacycles. The first constant of magnetic crystallographic anisotropy for the ferrites tested increases with a decrease in the temperature, at first slowly and then, in the temperature interval 400-200K, rapidly, and then again slowly, always remaining positive. At room temperature, it is equal to $2.9 \cdot 10^6$ erg/cm³; at the temperature of boiling oxygen it is $7.46 \cdot 10^6$ erg/cm³. Thermomagnetic treatment of a single crystal (heating from the temperature of boiling oxygen to room temperature in a field of 10,000 oersteds) causes induced anisotropy. At room temperatures and above, losses due to rotary hysteresis have normal character. They increase with an increase in the field, attain a maximum, and then decline

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ACCESSION NR: AP5021078

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to zero. At low temperatures, these losses are very great and do not completely disappear even in a field of 40,000 oersteds. As a result of thermomagnetic treatment, losses due to rotary hysteresis decrease, their maximum shifts to the side of high fields, and they disappear in lower fields. "In conclusion we express our deep indebtedness to T. M. Perekalina and A. A. Askochenskii for furnishing us the samples of single crystal ferrites." Orig. art. has: 3 formulas and 6 figures

ASSOCIATION: Institut fiziki, Sibirskogo otdeleniya AN SSSR, Institut tsvetnykh metallov im. M. I. Kalinina, Krasnoyarsk (Institute of Physics, Siberian Branch AN SSSR, M. I. Kalinin Institute of Nonferrous Metals, Krasnoyarsk)

^{YV, 55}
SUBMITTED: 10Feb83

ENCL: 00

SUB CODE: SS

NR REF SOV: 005

OTHER: 014

Card 3/3

PP

... .. Pad

... .. Barkhausen effect, single crystal, ferrite, nickel cobalt, tempera-

"APPROVED FOR RELEASE: Thursday, July 27, 2000

CIA-RDP86-00513R00041122

APPROVED FOR RELEASE: Thursday, July 27, 2000

CIA-RDP86-00513R00041122

ACCESSION NR:

EWT(m)/EWP(t)/EWP(z)/EWP(b)
AP5019849

IJP(c)

JD/HW

UR/0181/65/007/008/2362/2366

Handwritten initials: *ES*

AUTHOR: Sudakov, N. I.; Gendelev, S. Sh.; Drokin, A. I.

TITLE: Measurement of rotational hysteresis loss in nickel cobalt ferrite single crystals resulting from heat treatment and magnetic annealing

SOURCE: Fizika tverdogo tela, v. 7, no. 8, 1965, 2362-2366

TOPIC TAGS: magnetic hysteresis, magnetic domain structure, magnetic domain boundary, ferrite, nickel containing alloy, cobalt containing alloy

ABSTRACT: This is a continuation of earlier work by the authors (FMM v. 13, 788, 1962; FTT v. 4, 2293, 1962; Izv. vuzov fizika no. 2, 141, 1963 and elsewhere), where it was shown that the rotational hysteresis losses increase with increasing magnetic field in spite of the theoretical predictions, owing to the radical re-alignment of the domain structure. The present article reports the first results on nickel-cobalt ferrites $\text{Ni}_{0.71}\text{Co}_{0.03}\text{Fe}_{2.20}\text{O}_4$ grown by the Verneuil method. The uniform magnetic field (up to 30 kOe) was rotated in a plane parallel to the (100) surface of the crystal. The test procedure is briefly described. Prolonged annealing at 300C and subsequent slow cooling leads to a decrease of the loss in weak and medium fields at room temperature and to an increase of the loss at higher temperatures. This is attributed to redistribution of the ions as a result of

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ACCESSION NR: AP5019849

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electron exchange under the influence of the domain-boundary fields. This results in formation of potential barriers that prevent the realignment of the domain structure in the rotating magnetic fields, thus reducing the losses at low room temperatures. The potential wells disappear with increasing temperature and the losses increase. Magnetic annealing superimposes uniaxial anisotropy on the ordinary crystallographic anisotropy, thus contributing to realignment of the domain structure and to an increase in the loss. The presence of electron diffusion is confirmed by the perminvar effect of the partial hysteresis loop during slow cooling of the sample. The causes of the losses to rotational hysteresis in strong fields are still difficult to explain. Orig. art. has: 3 figures.

ASSOCIATION: Institut tsvetnykh metallov im. M. I. Kalinina (Institute of Non-ferrous Metals); Institut fiziki SO AN SSSR, Krasnoyarsk (Institute of Physics, SO AN SSSR) 44,55

SUBMITTED: 17Nov64

ENCL: 00

SUB CODE: SS, EM

NR REF SOV: 019

OTHER: 005

nw

Card 2/2

L 8548-66 EWT(1) IJP(c)

ACC NR: AP5024686

SOURCE CODE: UR/0056/65/049/003/0713/0719

AUTHOR: Drokin, A. I.; Sinegubov, V. I.

ORG: Institut fiziki Sibirskogo otdeleniya Akademii nauk SSSR Institute of Physics,
Siberian Department of the Academy of Sciences SSSR

TITLE: Investigation of the boundary layers between domains in some ferrites with spinel structure

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 3, 1965, 713-719

TOPIC TAGS: ferrite, magnetic domain boundary, magnetic domain structure, Kerr effect, magnetization, metal heat treatment, manganese containing alloy, cobalt containing alloy, nickel containing alloy, crystal lattice parameter

ABSTRACT: This is a continuation of an earlier investigation of domain boundaries in ferrites (Izv. AN SSSR ser. fiz. v. 28, 545, 1964), and deals with the domain boundaries in single crystals of iron-manganese, iron-cobalt, and iron-nickel ferrites, and with the influence of heat treatment on the changes in the boundary layers between domains. The single crystals were grown by the Verneuil method and

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ACC NR AP5024686

their properties established by chemical and x-ray diffraction analysis. The investigation procedure, which is based on the Kerr effect, is described in detail. A study was made of the width of domain boundaries, their polarity, the magnetization distribution in them, and the influence of heat treatment on the width of the domain boundaries. Plots are given of the distribution of magnetization in the boundaries of 180° and 71° neighborhoods. The results show that in the initial state the boundary domain width lies within 2.8--4.2 in iron-manganese ferrite, within 0.25--0.35 in iron-cobalt ferrite, and within 8.9--9.5 for 180° boundaries and within 3.5--4.0 for the 71° boundaries in iron-nickel ferrite. When there is a change in the structure of the iron-manganese ferrite, a double domain system is observed, with boundaries exhibiting asymmetric magnetization distribution. The magnetization distribution is uniform in the 180° boundaries in the iron-cobalt and iron-nickel ferrites. In the iron-nickel ferrite the magnetization distribution is asymmetric in the 71° boundaries. The boundary polarity is random and may vary even within the same boundary if the latter is split by obstacles. In ferrites sensitive to heat treatment (iron-cobalt and iron-nickel) the boundary decreases after heat treatment, the absolute values of the first magnetocrystalline anisotropy constants increase, and the lattice parameters decrease only slightly. These changes agree with Neels theory. Orig. art. has: 5 figures and 2 formulas.

Card 2/3

L 8548-66

ACC NR: AP5024686

SUB CODE: SS, EM/ SUBM DATE: 11Feb65/ ORIG REF: 010/ OTH REF: 005

jw

Card 3/3

KIRENSKIY, L.V.; DEKUL, A.I.; LAPTEY, D.A.; TARASOVA, N.V.,
red.

[Temperature magnetic hysteresis in ferromagnetics and
ferrites] Temperaturnyi magnitnyi gisterezis ferro-
magnetikov i ferritov. Novosibirsk, Red.-izd. otdel
Sibirskogo otd-niia AN SSSR, 1965. 157 p. (MIRA 18:11)

DROKIN, A.I.; SUDAKOV, N.I.; SIDOROV, F.K.; YARICHINA, K.V.

Magnetic crystallographic anisotropy and losses on rotational hysteresis in single crystals of cobalt ferrites. Izv. SO AN SSSR no.6. Ser. tekhn. nauk no.2:103-109 '65.

(MIRA 18:11)

1. Institut fiziki Sibirskogo otdeleniya AN SSSR, i Institut tsvetnykh metallov imeni M.I. Kalinina, Krasnoyarsk.

L 26668-66 EWT(1)/EWT(m)/EWA(d)/T/EWP(t) IJP(c) JD/HW/AT

ACC NR: AP6010409

SOURCE CODE: UR/0126/66/021/003/0423/0429

AUTHORS: Drokin, A. I.; Sudakov, N. I.; Gendelev, S. Sh.; Ryabinkina, L. I.

76 B

ORG: Institute for Physics, SO AN SSSR (Institut fiziki SO AN SSSR)

TITLE: Influence of ion diffusion during thermal and thermomagnetic treatment on the magneto-crystallographic anisotropy in single crystals of nickel-cobalt ferrites

18

SOURCE: Fizika metallov i metallovedeniye, v. 21, no. 3, 1966, 423-429

18

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18

TOPIC TAGS: ferrite, magnetic crystal, magnetic anisotropy, nickel compound, cobalt compound, crystal anisotropy, temperature dependence, electric conductivity, magnetic field, thermomagnetic effect, single crystal

ABSTRACT: The effect of long-term, low-temperature annealing on the temperature dependence of the first magneto-crystallographic anisotropy constant and on electrical conductivity of single crystals of nickel-cobalt ferrites was determined. The effect of cooling the specimen in a magnetic field of 15 000 oersteds on the magnetic anisotropy in the latter was also studied. The experiments were carried out over the temperature interval of -200 to 300C, and the results are presented graphically (see Fig. 1). It was found that the temperature dependence of K_1 , the first magneto-crystallographic constant, obeyed the relationship

$$K_1 = K_0 e^{-\alpha T}$$

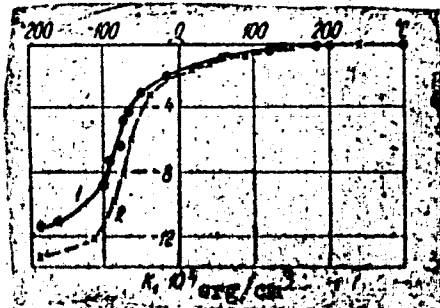
Card 1/2

UDC: 538:245

L 26658-66

ACC NR: AP6010409

Fig. 1. Temperature dependence of the first anisotropy constant of a nickel-cobalt ferrite: 1 - prior to annealing; 2 - after a 48-hour annealing period at 3000.



proposed by H. L. Bryukhatov and L. V. Kirenskiy (ZhETF, 1938, 8, 198), where K_1 is the first magneto-crystallographic constant, K_0 - its value at 0K, α - a constant, and T - the absolute temperature. It was also found that annealing increases the absolute magnitude of the anisotropy constant and electrical resistance and that thermomagnetic treatment induces axial anisotropy. It is concluded that the observed effects are due to migration of ions in the ionic lattice. Orig. art. has: 6 graphs and 5 equations.

SUB CODE: 20/ SUBM DATE: 16Nov64/ ORIG REF: 006/ OTH REF: 009

Card 2/2 BLG

L 25512-66 EWT(l)/EWT(m)/EWP(w)/EWA(d)/T/EWP(t) IJP(c) JD

ACC NR: AP6011400

SOURCE CODE: UR/0057/66/036/003/0521/0525

AUTHOR: Drokin, A.I.; Salanskiy, N.M.; Popova, A.A.; Smolin, R.P. 50
B

ORG: Institute of Physics of the SO AN SSSR, Krasnoyarsk (Institut fiziki SO AN SSSR)

TITLE: Barkhausen effect in magnesium-manganese ferrite single crystals

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 3, 1966, 521-525 18

TOPIC TAGS: magnetic hysteresis, Barkhausen jump, single crystal, ferrite, magnesium, manganese, solid solution, temperature dependence

ABSTRACT: Magnetic hysteresis and the Barkhausen effect have been investigated at temperatures from 20 to -196°C in magnesium-manganese ferrite single crystals of six different compositions. The crystals were grown in an oxyhydrogen flame by the Verneuil technique, using an apparatus similar to that described by K.S. Popov (Izv. AN SSR, Ser. fiz. 10, 505, 1946). The compositions of the materials (expressed in mole percent of MgO, MnO, and Fe_2O_3) ranged between 7.5 and 25% MgO, 25 and 55.5% MnO, and 33.5 and 50% Fe_2O_3 . Two of the samples contained 50 mole percent Fe_2O_3 . All the crystals contained small quantities of hausmannite. Most of the measurements were made on $0.2 \times 1.5 \times 10^{-3}$ mm³ rectangular rods cut with the long axis in a [100] direction and the large face parallel to the (100) planes. The Barkhausen jumps were recorded during slow reversal of fields ranging in strength from 40 to 80 Oe. The hysteresis loops were highly rectangular at all temperatures, the squareness ratio in

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UDC: 538.12

L 25512-66

ACC NR: AP8011400

one case being 98.1%. For all the crystals the field distribution of Barkhausen jumps (number of jumps per unit change in the magnetizing field as a function of the magnetizing field) exhibited two sharp maxima at fields corresponding to the bends of the hysteresis loop. It is suggested that these maxima may be associated with nucleation and the disappearance of domain structure. The amplitude distribution of the Barkhausen jumps was approximately exponential in all the materials. The temperature dependence of the Barkhausen jump amplitude distribution for the two materials containing 50% Fe₂O₃ was anomalous. In the other four materials the numbers of Barkhausen jumps of all sizes increased with decreasing temperature, the number of jumps remaining approximately constant between about -160 and -80° C and varying greatly with the temperature at both lower and higher temperatures. It is suggested that the existence of a temperature interval in which the number of Barkhausen jumps is temperature independent may be of use in the design of low noise devices. In the two materials containing 50% Fe₂O₃ the number of Barkhausen jumps of all sizes decreased rapidly with decreasing temperature, and at the lowest temperatures the Barkhausen effect could not be observed at all, although hysteresis loops were present. No explanation is offered for this anomalous behavior. Orig. art. has: 5 figures and 1 table.

SUB CODE: 20

SUBM DATE: 14Apr65

ORIG. REF: 008

Card

2/2

PB

ACC NR: AF6036985

(A,N)

SOURCE CODE: UR/0181/66/008/011/3363/3365

AUTHOR: Drokin, A. I.; Sudakov, N. I.; Gendelev, S. Sh.; Yanitskiy, V. K.

ORG: Institute of Physics, SO AN SSSR, Krasnoyarsk (Institut fiziki SO AN SSSR)

TITLE: Influence of heat treatment on the magnetic-crystallographic anisotropy and rotation-hysteresis loss in lithium pentaferriite single crystals

SOURCE: Fizika tverdogo tela, v. 8, no. 11, 1966, 3363-3365

TOPIC TAGS: lithium compound, magnetic anisotropy, magnetic hysteresis, temperature dependence, annealing

ABSTRACT: The authors have investigated the influence of heat treatment on the temperature dependence of the anisotropic constant and the field dependence of rotation-hysteresis losses in a temperature range much larger than in earlier investigations by others. In addition they investigated the temperature dependence of the magnetic-anisotropy constants in a wider range of temperatures. The single crystals were grown by the method described by V. N. Seleznev et al. (Voprosy radioelektroniki, ser. III, no. 9, 27, 1962) from a charge having a composition $6\text{Li}_2\text{CO}_3 \cdot 3\text{Li}_2\text{Fe}_2\text{O}_3 \cdot 60\text{PbO}$, resulting in a crystal having the formula $\text{Li}_{0.48}\text{Fe}_{2.25}\text{O}_4$. The tests were made on a spherical sample. The magnetic-anisotropy constant was determined by torque measurements in fields of 20 000 Oe. The hysteresis losses were calculated from the area between the torque curves plotted in both field directions during the reversal of magnetization cycle. The results have shown that quenching in air from 800C increases

ACC NR: AP6036050

$\text{Co}_{0.94}\text{Fe}_{0.12}\text{Fe}_{1.08}^{3+}\text{O}_4$, $\text{Mg}_{0.5}\text{Mn}_{0.5}\text{Fe}_2\text{O}_4$, $\text{Ni}_{0.71}\text{Co}_{0.03}\text{Fe}_{0.2}^{2+}\text{Fe}_{2.04}^{3+}\text{O}_4$, and $\text{Y}_3\text{Fe}_5\text{O}_{12}$. The Turov-Mitsek formula is found to be in satisfactory agreement with the experiments at low temperatures. Near the Curie point, the linear dependence of the spontaneous magnetization on the temperature, which was expected from thermodynamic consideration, holds true only for ferrites that are stable with respect to thermal and magnetic annealing. Orig. art. has: 3 figures and 13 formulas.

SUB CODE: 20/ SUBM DATE: 30Apr66/ ORIG REF: 014/ OTH REF: 005

Card 2/2

DROKIN, A. V.

Methods of solving composite arithmetical exercises. Mat. v. shkole No 3,
1952.

~~DRONIN, A. V.~~ [deceased]

New-design range finder and altimeter for school use. Uch.zap.Kab,
ped.inst. no.8:42-44 '55. (MIRA 10:3)
(Rangefinding) (Altimeter)

DROKIN, V., tokar'.

Utilize all production reserves. Nauka i zhizn' 23 no.5:29-30 '56.
(MLRA 9:8)

1. Khar'kovskiy turbinnyy zavod imeni S.M. Kirova, chlen Vsesoyuznogo obshchestva po rasprostraneniyu politicheskikh i nauchnykh znaniy.
(Kharkov--Turbines)

Shchepin, V. D.

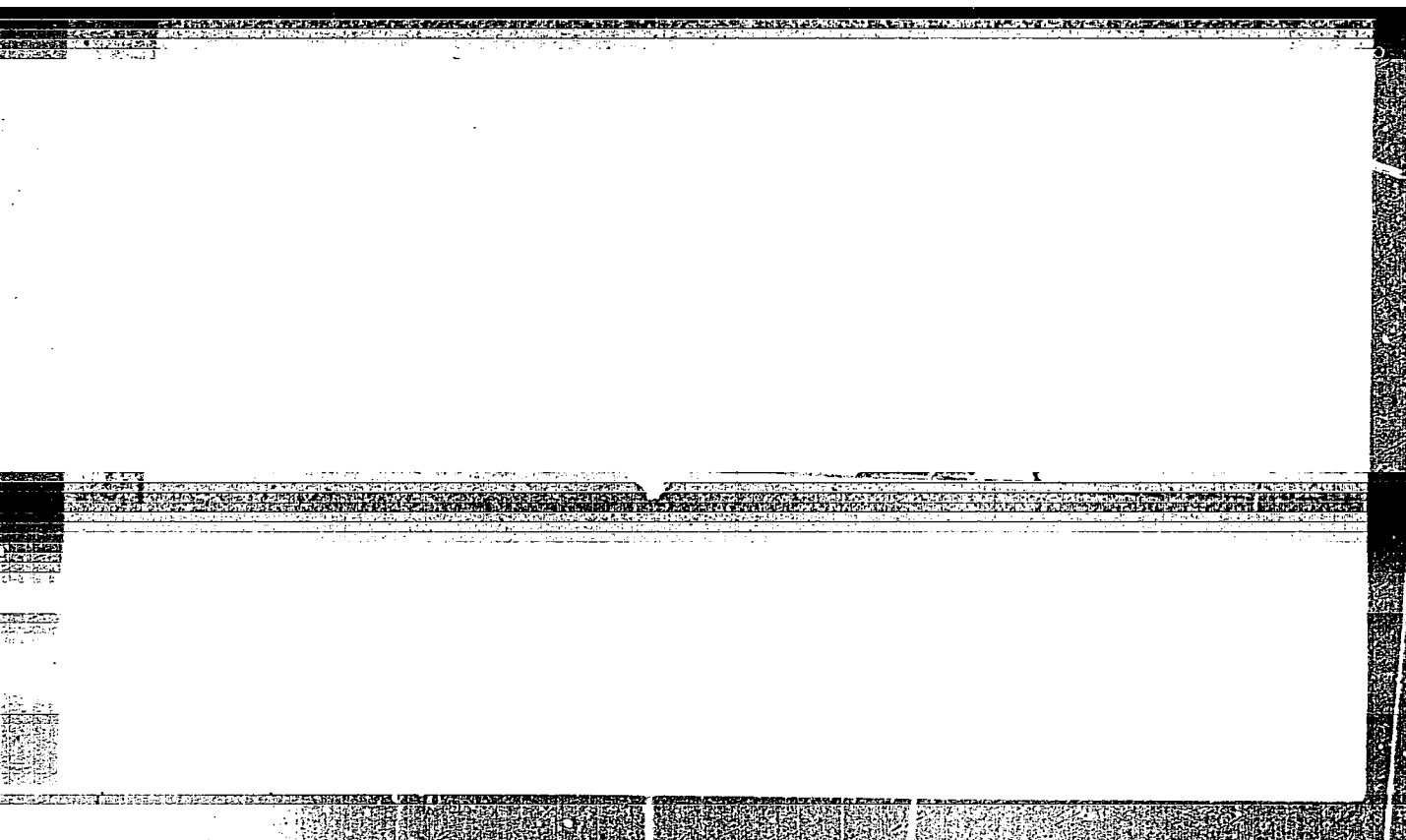
My methods of rapid machining of metals Kiev, Gos. nauchno-tekhn. izd-vo mashino-stroit.
lit-ry Ukr. otd-nie 1952. 58 p. (53-32299)

TS460.D7

DERKIN, V.D.; KHUKHRIY, A.A.; KOSTYUKOV, Ya.Kh., professor, doktor tekhnicheskikh nauk; redaktor; DONSKOY, Ya.Ye., redaktor; SHIVCHENKO, M.G., tekhnicheskiy redaktor

[Perfecting the technology of finishing large machine parts] So-
vershenstvovanie tekhnologii obrabotki krupnykh detalei.

[Khar'kov] Khar'kovskoe obl.isd-vo, 1955. 113 p. (MLRA 9:3)
(Machinery--Construction)



DROKONOV, Ye.M., inzh.; ALEKSEYEV, O.N., inzh.; KIRILLOV, A.I., inzh.

The BMZ gas turbine with 3,550 hp. rating. Energomashinostroenie
10 no.7:23-25 J1 '64. (MIRA 17:9)

ACC NR: AP6021481

(A)

SOURCE CODE: UR/0413/66/000/011/0111/0111

INVENTOR: Shishkin, V. A.; Drokonov, Ye. M.; Avdeyev, V. D.; Zarubin, Ye. I.

ORG: None

TITLE: A reversing mechanism for internal combustion engines. Class 46, No. 182440 [announced by the Bryansk Machine Building Plant (Bryanskiy mashinostroitel'nyy zavod)]

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 11, 1966, 111

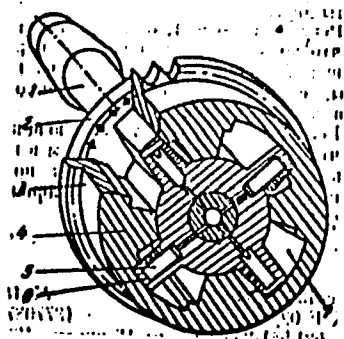
TOPIC TAGS: internal combustion engine, engine control system, engine crankshaft

ABSTRACT: This Author's Certificate introduces a reversing mechanism for internal combustion engines which contains a torsional hydraulic cylinder located in the drive unit between the crankshaft and the camshaft. The torsional cylinder is positively stopped at the extreme positions of the lobes by means of several hydraulic locks located within the cylinder itself.

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UDC: 621.43-581-229.384

ACC NR: AP6021481



1--housing; 2--sprocket; 3--lobes; 4--hub; 5--spring-loaded pistons; 6--cavities;
7--hydraulic cylinder cavities

SUB CODE: 13 21 SUBM DATE: 17Jun63

Card 2/2

VENDT, V.P.; DROKOVA, I.G.

Determination of vitamin D₂ in presence of sterols and of products
of ergosterol photochemical conversion. Ukr.biokhim.zhur. 22 no.2:
160-165 '50. (MLRA 9:9)

1. Institut biokhimi Akademii nauk URSR, Kiy.
(VITAMINS—D)

1-10
1-10
Determination of vitamin E in wheat-germ oil; V. F. Vendt and I. G. Drokova (Inst. Biochem., Acad. Sci. Ukr. S.S.R., Kiev). *Ukrain. Biokhim. Zhur.* 23, 299-302 (1951) (Russian summary).—A chromatographic adsorption procedure is presented which supposedly obviates the non-specific factors encountered in the alc. vitamin E-HNO₃ reaction now in use. B. S. Levine

①

DROKOVA, I.G.; LAKHNO, Yu.V.; FIDMAN, R.S.; CHAGOVETS', R.V.

Vitamin B and tocopherol content of embryos, bran, and oil of some wheat varieties of the Ukrainian S.S.R. Ukr.biokhim.zhur. 23 no.4: 371-375 '51. (MIRA 9:9)

1. Institut biokhimii Akademii nauk URSS, Kiiiv.
(UKRAINE--WHEAT--VARIETIES) (VITAMINS--B) (TOCOPHEROL)

"APPROVED FOR RELEASE: Thursday, July 27, 2000

CIA-RDP86-00513R00041122

APPROVED FOR RELEASE: Thursday, July 27, 2000

CIA-RDP86-00513R00041122

VENDT, V.P.; ~~DROKOVA, I.G.~~

Production and some properties of artificial complexes of proteins
with vitamins A, D₂, D₃, and E. Vitaminy no.2:25-29 '56. (MLRA 10:8)

1. Institut biokhimii Akademii nauk USSR, Kiyev
(VITAMINS) (PROTEINS)

DROKOVA, I. G. Cand Biol Sci -- (diss) "Artificial complexes of vitamin E and proteins, their production, and properties." Kiev, 1967. 13 pp 20 cm. (^{Department} ~~Section~~ of Biol Sci, Acad Sci UkSSR. Inst of Biochemistry), 100 copies (KL, 24-57, 116)

PILIPENKO, A.T. [Pylypenko, A.T.]; DRUKOVA, I.G. [Drukova, I.H.]

Absorption spectra and dissociation constants of diphenylthio-
carbazone (dithiazone). *Vant.zap.Iv.un.* 16 no.15:113-116
'57. (MIRA 11:11)

(Dithiazone--Spectra) (Dissociation)

DROKOVA, I.G.

Biological properties of artificial protein complexes with
vitamin E [with summary in English]. Ukr.biokhim.zhur. 29 no.2:
206-212 '57. (MIRA 10:7)

1. Institut biokhimi Akademii nauk Ukrainakoy SSR, Kiyev.
(TOCOPHEROL) (PROTEINS)

DROKOVA, I.G.

Antioxygenic properties of concentrated tocopherol preparations
[with summary in English]. Ukr.biokhim.zhur.29 no.2:242-248 '57.
(MLRA 10:7)

1. Institut biokhimi Akademii nauk Ukrainsskoy SSR, Kiyev.
(TOCOPHEROL) (ANTIOXIDANTS)

USSR/Human and Animal Physiology: Metabolism

T-2

Abs Jour : Ref Zhur - Biol., No 14, 1958, No 64987

Author : Drokovna I.G.

Inst : -

Title : The Biological Properties of Synthetic Complexes of Protein and Vitamin E.

Orig Pub : V sb.: Vitaminy. 3. Kiyev, AN, USSR, 1958, 152-158

Abstract : Experiments were performed on rabbits. In order to examine the biological activity of concentrates of vitamin E and synthetic tocopherol-protein complexes, in addition to determining the weight curves of the experimental animals, two tests were employed--determination of the urinary creatine index and the xanthine-oxidase activity of liver homogenates. It was shown that the biological activity of the tocopherol-protein complex corresponds to the biological activity of free tocopherol.

Card : 1/1

DROKOVA, I.G.; VHEBT, V.P.

Influence of tocopherol on the oxidation of ergosterol and
7-dehydrocholesterol by oxygen, catalyzed with hemoglobin.
Vitamins no.4:114-116 '59. (MIRA 12:9)

1. Institut biokhimii Akademii nauk USSR, Kiev.
(TOCOPHEROL) (ERGOSTEROL) (CHOLESTEROL)

DROKOVA, I.G. [Drokova, I.H.]

Investigating the β -carotene content of algae. Ukr.bot.zhur. 17
no.2:39-42 '60. (MIRA 13:11)

1. Institut botaniki AN USSR, otdel biokhimi rasteniy.
(Algae) (Carotene)

DROKOVA, I.G [Drokova, I.H.]

The alga *Dunaliella salina* Teod. as a source of β -carotene.
Ukr.bot.zhur. 18 no.4:110-112 '61. (MIRA 14:8)
(Ukraine--Algae) (Carotene)

DROKOVA, I.G. [Droková, I.H.]

Studying the conditions of β -carotene accumulation in the alga
Chlorella pyrenoidosa Chick. Ukr. bot. zhur. 18 no.5:65-69 '61.
(MIRA 17:2)

1. Institut botaniki AN UkrSSR, otdel biokhimi rasteniy.

VENDT, V.P.; DROKOVA, I.G. [DrokoVA, I.H.]

Ribonucleic acid as a growth stimulator of algae. Ukr. bot. zhur. 19
no.6:60-63 '62. (MIRA 16:2)

1. Institut botaniki AN Ukr-SSR i Institut biokhimii AN Ukr-SSR.
(Algae—Cultures and culture media) (Nucleic acids)

DROKOVA, I.G. [Drokova, I.H.]; LIVETSKAYA, R.TS. [Livets'ka, R.TS.]

Determination of β -carotene in the alga *Dunaliella salina* Teod.
Ukr. bot. zhur. 20 no.3:94-96 '63. (MIRA 17:9)

1. Otdel biokhimii Instituta botaniki AN UkrSSR.

DROKOVA, I. G.; MASYUK, N. P.

"Biosynthesis of carotene by *Dunaliella salina*."

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

AS UkSSR.

DROKOVA, I.C. [Drokoval, I.H.]; POPOVA, R.TS.; TUPIK, N.D. [Tupyk, N.D.]

Carotene content in the alga *Dunaliella salina* Teod. under the conditions of laboratory cultivation. Ukr. bot. zhur. 21 no.5:44-49 '64. (MIRA 18:2)

1. Otdel biokhimi Instituta botaniki AN UkrSSR.

DROKOVA, I.G. [Drokovu, I.H.]

Determination of pigments in the alga *Dunaliella salina* Teod.
by paper chromatography. Dop. AN UFSR no.12:1607-1609 '65.
(MIRA 19:1)

1. Institut botaniki AN UkrSSR. Submitted November 2, 1964.

DROLIKOWSKI, Czenlaw, mgr.ins.

High voltage contactors with sulphur hexafluoride as extinguisher.
Wiad elektrotechn 30 no.2:43-46 F '62.

1. Politechnika, Poznan.

DRCMAN, F.

Further improvement of equipment for signaling and regulation maximum kilowatts and some remarks based on practical experience. P. 134.

SO: East European Accessions List, Vol. 3, N o. 9, Sept. 1954, Lib. of Congress