22247
R/008/60/000/005/006/014
A231/A126

10.9110

AUTHOR: Arcan, M.

TITLE: Investigations into the bending of girders with rectangular
             cutouts

PERIODICAL: Studii şi Cercetări de Mecanică Aplicată, no. 5, 1960, 1175 -
             1193

TEXT: The author examines the pure bending of girders with an axial
row of rectangular cutouts in function of the influence of this row of cut-
outs on the distribution of stresses and the ability of distortions of the
girder. Special attention is given to the influence of the row of cutouts
on the distribution of the unitary stresses in front of the webs. In a fu-
ture paper, he will present the investigations on bending with cutting forces.
The experimental studies have been carried out by the photo-elastic method
in the laboratories of the INCERC (Institutul de cercetări pentru construc-
tii şi economia construcţiilor = Research Institute for Constructions and
Economy of Constructions) in Bucharest. Models, having some characteristics
have been studied. αH is the height of the cutout, in which H is the height

Card 1/7

22247
R/008/60/000/005/006/014
A231/A126

Investigations into the bending of...

of the girder and α varies between 0.15 and 0.66. βH is the base of the cutout, in which β varies between 0.01 and 0.5. $\beta'H$ is the base of the web, β' varying between 0.166 and 1.165. $K = \frac{\beta}{\alpha}$ varies between 0.015 and 3.333. $K' = \frac{\beta'}{\alpha}$ varies between 0.25 and 4.6. Photoelastic tests for the determination of isoclines have been made on plexiglass samples and for the determination of isochromates on Dinox F-110 samples. Isoclines have been established in white light and recorded by drawing. Isochromates have been recorded by photographing in sodium monochromate light. The device used for bending tests is shown. The following observations have been made on the behavior and participation in distortion of different zones of the girder: The bases of the girders have formed an isoclinal zone of $0°$ parameter, except disturbances around the corners. The webs have a similar trend, not depending on their absolute dimensions for the same $K' = \frac{\beta'}{\alpha}$ ratio. In case of $K' > 1$, the following categories of singular points could be observed: a) Internal singular points of the attractive type, one in every web, located in its center; b) Singular contour points of the repulsive type, one at every vertical side of the cutout. They indicate a change of the sign of stress on the contour and thus are neutral; c) Singular corner points located at every corner of the cutouts, being of II order. In case

Card 2/7

22247
R/008/60/000/005/006/014
A231/A126

Investigations into the bending of...

of K'<1 two more singular points are formed, located at the two ends of the webs, on their vertical axes. They are singular internal points of the repulsive type. In case of their appearance, the singular internal point located in the center of the web is transformed into a repulsive-type point. In this case the singular corner points become attractive-type points. The study of isochromates confirms the observations made on isoclinal and isostatic tables. · The isochromatic tables present in the base-bands parallel to the girder axis the characteristics of the pure bending of the band. If the height of the cavities is relatively small, $\alpha < 0.33$, the behavior of these bands is not disturbed and their parallelism is maintained behind the zones of the cutouts. In case of $\alpha > 0.33$, the influence of the cutouts is extended to the outer fibers. If K'>1, there appear on both sides of the cutouts zones of very small stresses along the height of the cutouts and along the length $\frac{\alpha H}{2}$ (Fig. 10 b). The singular internal points are in the neutral zones. On the basis of these data, the author was able to establish the type of distortion of cutout and web. The singular points located in the middle of the verticals which limit the cutout, correspond to some inflection points. The formation of a neutral zone having a 2a height is very important. The evaluation of the unitary normal forces in the vertical sec-

Card 3/7

R/008/60/000/005/006/014
22247
A231/A126

tion of the web axis shows a Navier type diagram modified by the appearance.
of some high neutral zones. In case of $K' \leq 1$, the unitary normal forces in
the external fiber of the web's transversal section is superior to the uni-
tary normal stress in the external fiber of the transversal section in front
of the cutout, which is contrary to expectations. This is due to the fact
that the inertia moment of the cutout section is smaller, so that the uni-
tary normal force in the external fiber is greater than in the web's sec-
tion. A calculation formula for the unitary normal force in the most
stressed section of the web can easily be established. Starting with

$$\sigma = \pm \, t(y - a), \qquad\qquad (1),$$

in which $y \geq a > 0$, and t is a constant of proportionality, the author deduces

$$\sigma = \pm \frac{M}{I_0 - a S_0} (y - a), \qquad (3)$$

in which M is the external moment, I_0 the inertia moment of the active sec-
tion in relation to the neutral axis and S_0 twice the value of the static
moment of one of the active section's half value. The expression (3) is a
general form of the Navier's formula for the pure bending. In case of

Card 4/7

22247
R/008/60/000/005/006/014
A231/A126

K'<0.5, the height of the inactive zone increases considerably (h'>0.75), (Fig. 15). The force diagrams are no longer linear, but can be represented by two straight lines (Fig. 16 a, b, c). The peaks A on the graphs appear due to a concentration of stresses produced by the corners. In this case the unitary normal forces are given by

$$\sigma = \pm \frac{M}{I_1 + \xi I_2 - \xi a S_2} y \qquad y \geqslant \frac{H_1}{2} > 0, \qquad (4)$$

If a becomes 0 and $\xi = 1$, one obtains the classical equation of Navier. The author finally studies the distortion by pure bending of girders with cutouts. In case of K'>1, the non-stressed zones appear as in Figure 10 b. The calculation of these girders is facilitated by the establishment of a ratio between the elasticity module of a girder without cutouts, called equivalent elasticity module E_{ech}, and the elasticity module of a girder with cutouts E,

$$\frac{E_{ech}}{E} = \frac{1}{1 + \frac{a^3}{1 - a^3} \cdot \frac{\alpha + \beta}{K'\alpha + \beta}} \qquad (8)$$

Nomograms supply the values of the $\frac{E_{ech}}{E}$ ratio in function of K'. On the

Card 5/7

22247

Investigations into the bending of...

R/008/60/000/005/006/014
A231/A126

basis of these nomograms the equivalent elasticity module of girders with
cutouts and thus the sag of these girders, due to the constant bending mo-
ment can easily be computed. These nomograms also show that the influence
of the cavities on the distortion produced by bending the tested girders is
low. In case of $K' \leqslant 1$, the distortions can be computed on the basis of the
following considerations: the extremities of the webs alone participate in
the distortion of the bases. Thus, the calculation of distortions can be
accomplished by considering only the base sections along the whole length of
the girder. There are 15 figures, 3 sets of photos and 8 references: 6 So-
viet-bloc and 2 non-Soviet-bloc.

SUBMITTED: April 23, 1960

Figure 10 b:
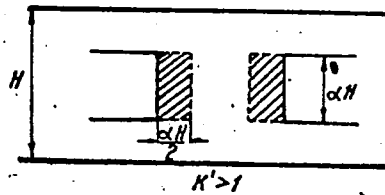
Card 6/7

24.4200

R/008/62/013/002/006/009
D272/D308

AUTHOR: Arcan, M.

TITLE: A method of designing rigidity diaphragms with a row
               of holes

PERIODICAL: Studii și cercetări de mecanică aplicată, no. 2,
               1962, 451 - 471

TEXT: The differential equation of the shearing forces in upright
beams is established, and solutions are given for various types of
loadings - uniformly distributed load (due to wind), triangular
load with its maximum at the diaphragm extremity (due to seismic ac-
tion) and concentrated loads at the diaphragm extremity. In all ca-
ses the conclusions were verified by photoelastic models. The method
of calculation is based on the hypothesis that the zone of the row
of holes can be replaced by a strip with reduced elasticity modulus,
obtaining thus a beam without holes with an inhomogeneous structure.
The results are given in the form of graphs. There are 10 figures.
ASSOCIATION: Institutul de cercetări în construcții și economia con-
             strucțiilor, București (Institute of Construction Re-
Card 1/1   search and Construction Economics)

12. 6σ̄v̄)

R/016/62/007/004/001/002
E191/E135

42030

AUTHORS: Arcan, M., and Nicolau, Ed.

TITLE: Investigations of load carrying building structures
              by means of plastic models

PERIODICAL: Revue de mécanique appliquée, v.7, no.4, 1962, 751-780.

TEXT: The work of the INCERC with models made of plastics
for the stress analysis of building structures is reported. The
diversity of the methods used is emphasised since every method is
limited. Models of up to 1 m size are used in spite of differences
of behaviour on account of a higher Poisson's ratio in plastics and
the unsuitability for destructive testing. Model laws have been
studied to determine the choice of materials and techniques and the
interpretation of results. The conditions of similarity are .
obtained from the equilibrium of an elementary slab, the geometric
relations between the deformations and displacements and the
physical relations between the stresses and strains. The similarity
factors are hereby determined only in part: the remaining factors
being chosen from the test conditions, including space available
and adequate deflections of the measuring devices.
Card 1/4

Investigations of load carrying ...   R/016/62/007/004/001/002
E191/E135

The inexpensive investigation of many design variants is made
possible by model techniques. Examples are discussed, including
several arch constructions, a circus roof structure, a multi-arch
factory roof and a restaurant structure. Distribution of load
carrying in complex statically indeterminate structures is among
the main features discoverable by models. Structural elements made
of composite materials have been examined by model techniques
including reinforced and pre-stressed concrete structural elements,
pressure distributions when two bodies with a different Young's
modulus are in contact (for instance, a foundation on soil), and
the simplification of models by the replacement of cavities with a
material of low modulus. For example, the neutral axis of
reinforced concrete beams was examined on the assumption of an
ideal bond. Reinforced concrete beams in the condition of
incipient cracking, owing to a loss of bond in the section between
the cracks, have been tested by model techniques. Reinforced
models with artificial cracks were used, made from a material
specially developed at the Institute with a high optical activity,
a reduced edge effect, and a capacity to be bonded with adhesives

Card 2/4

Investigations of load carrying .. R/016/62/007/004/001/002
E191/E135

to the reinforcement consisting of high tensile steel wire. Two
types of crack were tested, namely with and without the capacity
to transmit compressive stresses. For large crack heights it was
found that the neutral axis coincides with the tip of the crack
so that the crack does not propagate with an increase in the load.
Generally, photoelastic models were found to behave in close
agreement with actual full-scale structures. Pre-stressed complex
structures, such as the dome of the Bucharest State Circus
building, were model tested with strain gauges. Cavities can be
replaced by a material with a low equivalent shear modulus.
A wider range of materials is called for with Young's moduli
between 20 and 40 000 kg/cm². Practical hints are given on:
model making including pre-stressed models; method of pre-
stressing with cables and its inspection by sound frequency
measurement; strain and deflection measurements.
There are 24 figures and 1 table.

Card 3/4

Investigations of load carrying...   R/016/62/007/004/001/002
                                      E191/E135

ASSOCIATION: Nauchno-issledovatel'skiy institut po
             stroitel'stvu i ekonomike stroitel'stva - INCERC -
             Bukharest (Scientific Research Institute of
             Building and Building Economics - INCERC - Bucharest)

Card 4/4

ARCAN, M.; NICOLAU, Ed.

Structural strength of buildings studied with plastic models.
Studii cerc mec apl   13   no.3:621-649   '62.

1. Institutul de cercetari in constructii si economia constructiilor
INCERC, Bucuresti.   2. Membru al Comitetului de redactie, "Studii
si cercetari de mecanica aplicata" (for Arcan).

ARCAN, M.; NICOLAU, Ed.

"Stresses and deformations in the machine parts and joints" by
N.I.Prigorovskiy. Reviewed by M.Arcan and Ed.Nicolau. Studii
cerc mec apl 13 no.3:807-808 '62.

1. Institutul de cercetari in constructii si economia constructiilor
(INCERC), Bucuresti, si membru al Comitetului de redactie,
"Studii si cercetari de mecanica aplicata" (for Arcan).

IENESCU, Eliza, dr.: TURCANU, L. ; conf; MICLAUS, V., dr.; ABCAN, E., dr.:
URSU, Teodora, dr.

Difficulties of diagnosis of cerebral tumors in children. Diagnos-
tic value of the intracranial hypertension syndrome.(I.H.S.)
Pediatria (Bucur.) 13 no.5:359-374 S-O '64

1. Lucrare efectuata in Serviciile de pediatrie, neurologie si
neurochirurgie, Timisoara.

ARCANIN, Blanka, ing.

Pyrethrum, a plant protective. Kem ind 10 no.1:21-22   Ja '61.

1. Zavod za zastitu bilja, Zagreb.

POKROVSKIY, A.A.; ARCHAKOV, A.I.; DEVICHENSKIY, V.M.; SHUMKINA, O.B.

Materials on the distribution of aldolases, transaminases and esterases in liver cells. Dokl. AN SSSR 158 no.2:474-476 S '64.

1. Predstavleno akademikom A.N.Bakulevym.

(MIRA 17:10)

POKROVSKIY, A.A.; ARCHAKOV, A.I.

Study of the effect of promazine on the solubilization of liver
acetylesterase (3.1.1.6) as affected by carbon tetrachloride.
Dokl. AN SSSR 160 no.5:1203-1205 F '65.

(MIRA 18:2)

1. Vtoroy Moskovskiy gosudarstvennyy meditsinskiy institut im.
N.I. Pirogova. Submitted October 12, 1964.

PANCHENKO, L.F.; ARCHAKOV, A.I.

Activity of acid phosphatase (phosphomonoesterase-II) in the
brain of rats in traumatic shock. Biul.eksp.biol. i med. 59
no.5:51-53 '65.   (MIRA 18:11)

1. Kafedra biokhimii (zav. - chlen-korrespondent AMN SSSR
prof. A.A.Pokrovskiy) II Moskovskogo gosudarstvennogo medi-
tsinskogo instituta imeni N.I.Pirogova. Submitted July 12,
1964.

ARCHAKOV, B.G.; VASIL'YEV, V.N.; NEUSTROYEV, V.D.; POLOZOV, A.I.;
    PREOBRAZHENSKIY, A.A.

Comparative data on the determination of the concentration of the
smallpox vaccine virus by titration in chicken embryos and tissue
cultures. Vop.virus. 7 no.6:731-734 N-D '62.   (MIRA 16:4)
                    (VACCINES)   (SMALLPOX)

ARCHAKOV, N. V., Cand Med Sci -- (diss) "Morphology of the

Medial Cutaneous Brachial Nerve and Medial Cutaneous Ant Abra-

chial Nerve in Voronezh, 1957. 19 pp (Voronezh State

Medical Inst), 100 copies (KL, 48-57, 109)

- 66 -

ARCHAKOV, Yu.I., Cand Tech Sci -- (diss) "Study of the
stability of steels applicable in machines and devices
of the petroleum and chemical industry in high temperatures
and pressures of hydrogen." Len, 1958, 10 pp (Min of
Higher Education USSR. Len Order of Labor Red Banner
Tech Inst im Lensovet) 120 copies (KL, 29-58, 131)

- 48 -

69712
SOV/81-59-9-30466

/8.8100

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 9, p 59 (USSR)

AUTHOR: Archakov, Yu.I.

TITLE: Hydrogen in Steel

PERIODICAL: Tr. Leningr. tekhnol. in-ta im. Lensoveta, 1958, Nr 46, pp 125 - 132

ABSTRACT: The solubility of hydrogen (SH) in some ferrite and austenite steels
               and the effect of the individual alloying additions (W, V, Ti and Cr)
               on SH at a pressure of 100 atm and a temperature of 500°C are investigated.
               An installation is described for saturating metals with hydrogen permitting
               the fast cooling of samples from high temperatures to room temperature
               without reducing the gas pressure. The results obtained are presented in
               graphs and tables, from which follows that small additions of W (1.61%)
               and V (0.45%) increase SH 5.5 times and twice, respectively, an admixture
               of 0.48% Ti practically does not affect SH, and the increase in the Cr
               content to 13% increases SH only insignificantly. In alloyed steels of
               the austenite class SH is by 4 times higher than in carbon steel of
               grade 20 and by ~ 6 times higher than in alloyed steels of the ferrite
Card 1/2   class. With the aim of explaining the possibility of extending the law

ARCHAKOV, Yu. I. Cand Tech Sci -- (diss) "Study of the strength of steels used in machines and apparatus of the petroleum and chemical industries under high temperatures and hydrogen pressures." Len, 1959. 15 pp (Min of Higher Education USSR. Len Order of Labor Red Banner Technological Inst im Lensovet), 150 copies (KL, 41-59, 104)

ARCHAKOV, Yu. I.

TITLE: Conference on Autoclave Processes

PERIODICAL: Tsvetnyye Metally, 1959, Nr 7, pp 84-87 (USSR)

ABSTRACT: On 23-26 February 1959 a conference was held in Moscow for summing-up and coordinating work on autoclave processes in the metallurgy of heavy, non-ferrous, rare and noble metals.

Card 1/5

Card 2/5

Card 3/5

Card 4/5

18.7100

77508
SOV/80-33-1-17/49

AUTHORS: Archakov, Yu. I., Grebeshkova, I. D., Teodorovich, V. P.

TITLE: The Effect of Heat Treatment on Decarburization and Cracking of Steels While Under Hydrogen at 500-600° C and 800 kg/cm² Pressure

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol 33, Nr 1, pp 89-94 (USSR)

ABSTRACT: This study was started under the supervision of Professor V. V. Ipat'yev. Steel of type 40X (0.41% C; 0.85% Cr) and melt 7475 (0.18% C; 3.05% Cr) were hardened and subsequently tempered at various temperatures which allowed the obtaining of various Cr-content in the carbide phase and solid solution. The tests were made in an autoclave under hydrogen pressure of 800 atm. The carbon content, structure, and composition of the carbide phase before and after the tests were determined. The composition of the carbide phase was determined by means of the electrolytic dissolution (N. M. Popova, Carbide Analysis of Steel--Karbidnyy analiz stali--,

Card 1/3

The Effect of Heat Treatment on Decarburi-
zation and Cracking of Steels While Under
Hydrogen at 500-600° C and 800 kg/cm²
Pressure

77508
SOV/80-33-1-17/49

Oborongiz, 1957) and by means of chemical, and in some
instances, X-ray analysis. It was established that the
amount of chromium in the carbide phase increased with
the tempering temperature, and the rate of decarburiza-
tion decreased. Practically full decarburization was
achieved with tempering temperature equal to 550-700° C.
Metallographic investigation showed that the size of
microscopic cracks appearing along the grain boundaries
increased with the tempering temperature and with the
chromium content in the carbide phase. It was found
that steel with 0.18% C alloyed with up to 3% Cr resisted
the corrosive action of hydrogen better than steel 40X.
The investigated steels showed low resistance, however,
at 600° and 800 atm hydrogen pressure; evidently, the
amount of the alloying elements was insufficient to
bind all the carbon into carbides. Addition of 0.5-
1.0% molybdenum to steel with 0.16% C and 3% Cr did not
increase its resistance against the action of hydrogen

Card 2/3

The Effect of Heat Treatment on Decarburi-   77508
zation and Cracking of Steels While Under   SOV/80-33-1-17/49
Hydrogen at 500-600° C and 800 kg/cm²
Pressure

under the above-mentioned conditions. It was also
found that a new phase, a so-called "carbide precipitate,"
was formed in all decarburized steels on electrolytic
dissolution. In chromium steels, this precipitate con-
tained considerable amounts of chromium, and in chromium-
molybdenum steels, considerable amounts of Cr and Mo.
This new phase requires further studies. There are 2
tables; 1 figure; and 3 references, 1 U.K., 1 German,
1 Soviet. The U.K. reference is: N. Inglis, W. Andreus,
J. Ir. St. Int., 128, 383 (1933).

ASSOCIATION: All-Union Scientific Research Institute for Petrochemical
Processes (Vsesoyuznyy nauchno-issledovatel'skiy institut
neftokhimicheskikh protsessov)

SUBMITTED: January 20, 1959

Card 3/3

S/080/60/033/011/007/014
A003/A001

AUTHOR: Archakov, Yu. I.

TITLE: An Investigation of the Rate of Hydrogen Corrosion in Carbon Steel
             Pipes

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol. 33, No. 11, pp. 2547-2552

TEXT: The work was guided by professor V. V. Ipat'yev and is a continuation
of his work in (Refs. 1 and 2). The effect of external factors on the decarboniza-
tion of carbon steel was investigated here. The experimental method is given in
(Ref. 8). Carbon steel of the grades 20 and 30 was used. After the experiments
the pipes were cut and the butt sections were ground. The decarbonization depth
was investigated under a microscope with a magnification of 87 diameters. The
first series of experiments was made at hydrogen pressures from 50 to 800 kg/cm^2
and a temperature of 525°C. The data obtained with stresses not exceeding the
creep limit of steel form a straight line (Fig. 1). The dependence between the
decarbonization depth and the thickness of the pipe wall was investigated at
pressures from 50 to 300 kg/cm^2, a temperature of 525°C and a duration of 200
hours. It was shown that the decarbonization depth increases with the thickness

Card 1/3

S/080/60/033/011/007/014
A003/A001

An Investigation of the Rate of Hydrogen Corrosion in Carbon Steel Pipes

of the wall. The relation between the logarithm of the value of decarbonization depth and the logarithm of the value of the inner pipe radius is expressed by a straight line. The effect of the temperature on the decarbonization rate was investigated in samples with an outer diameter of 30 mm, a wall thickness of 10 mm, within the temperature range of 350-630°C and hydrogen pressures from 50 to 600 kg/cm². An exponential dependence of the constant of the decarbonization rate on the temperature was found. The results of the experiments show functional dependences between the decarbonization depth and the pressure, the temperature, the wall thickness and the inner diameter of the pipes.

Figure 1. Dependence of the Constant of the Decarbonization Rate K on the Hydrogen Pressure P (kg/cm²).
Wall thickness (in mm): 1 - 4, 2 - 7, 3 - 10, 4 - 12.

Card 2/3

Figure 1:

S/080/60/033/011/007/014
A003/A001

An Investigation of the Rate of Hydrogen Corrosion in Carbon Steel Pipes

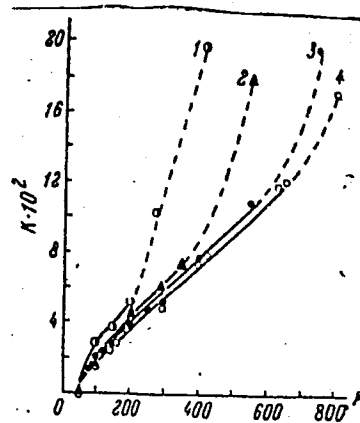There are 7 figures, 3 tables and 9 references: 6 Soviet, 2 English, 1 American.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy institut neftekhimicheskikh
protsessov (All-Union Scientific Research Institute of Petrochemical
Processes)

SUBMITTED: January 16, 1960
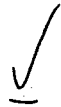
Card 3/3

S/080/60/033/011/008/014
A003/A001

AUTHOR: Archakov, Yu. I.

TITLE: The Derivation of a Formula for Calculating the Decarbonization Depth

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol. 33, No. 11, pp. 2553-2557

TEXT: A general kinetic equation is derived for the dependence of the
decarbonization depth in the corrosion process, which takes place in pipes made of
steel 20 at increased temperatures and high pressures of commercial hydrogen, on
the temperature, the pressure, the duration of action, the wall thickness and the
inner pipe radius. The work is a continuation of Ref. 1. The basic formula used
here: $\lg K = -A' \cdot \frac{1}{T} \cdot 10^4 + B$ is identical with Formula (5) in Ref. 1. The value
A' in this formula is a constant, the value B depends on the change of the pressure,
the inner radius of the curvature of the pipes and the thickness of the wall. The
dependence between the free term B and the pressure P at temperatures of 350 -
630°C was found. From a graph of the experimental data the following formula was
derived: $B = n \cdot \lg P - C_1$, where $n = 1.12$, $C_1 = 2.04$. Using other empirical
data, the following final formula is obtained:

$$\Delta l = A \cdot e^{-\frac{E}{RT}} \cdot \tau^{\alpha} \cdot P^n \cdot l^m \cdot R_2^{\mu}, \qquad (10)$$

Card 1/2

S/080/60/033/011/008/014
A003/A001

The Derivation of a Formula for Calculating the Decarbonization Depth

where Δl is the depth of the decarbonized layer (in mm), T is the absolute temperature (in °K), τ is time (in hours), P is the pressure of the gas (in kg/cm^2), l is the thickness of the pipe wall (in mm), R_2 is the inner pipe radius (in mm), E is the apparent activation energy of the decarbonization process for steel 20 which is 7,200 cal/g-atom.

$$A = A_o \cdot (\tau_o^{-\alpha} \cdot P_o^{-n} \cdot l_o^{-m+1} \cdot R_{2o}^{-\mu}),$$

where τ_o, P_o, l_o and R_{2o} are scales for measuring the values. For $\tau = 1$ hour, $P_o = 1$ kg/cm^2, $l_o = 1$ mm and $R_{2o} = 1$ mm, $A = A_o = 0.0076$ (for steel 20), $\alpha = 0.5$, n=1.12, m=0.71, $\mu = 0.58$. The discrepancy between the experimental and calculated values does not exceed 20-25%. The empirical equation (10) is valid for hydrogen pressures of 100-800 kg/cm^2 and temperatures of 350-600°C for the pipe samples investigated. It reduces the number of tests necessary for selecting steel used in the manufacture of apparatus and pipelines subjected to the action of hydrogen. There are 4 figures, 2 tables and 2 Soviet references.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy institut neftekhimicheskikh
              protsessov (All-Union Scientific Research Institute of Petrochemical
              Processes)
SUBMITTED: January 16, 1960
Card 2/2

18.3000

18.1151 /ﾍ ♀110

33835
S/137/62/000/001/171/237
A006/A101

AUTHORS: Archakov, Yu. I., Grebeshkova, I. D., Teodorovich, V. P.

TITLE: Hydrogen corrosion of ferrochrome alloys at 400 - 800 kg/cm
             hydrogen pressure and 600°C temperature

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 1, 1962, 76, abstract 1I541
             (V sb. "Stal'", Moscow, Metallurgizdat, 1961, 424-435)

TEXT: The authors analyze failure of carbon and alloyed steels under the
effect of H_2 of high-parameters. The mechanism of the process is explained. The
investigation was made at up to 4,000 hours holding time and 400 - 800 kg/cm^2
pressure of regularly renewed H_2. The authors investigated 15 alloys containing
C 0.05 - 0.42% and Cr 1.25 - 19.8%; the alloys had been previously normalized
(at 900 - 1,000°C) and tempered (at 600 - 720°C) with different times of holding.
Me_7C_3 type carbide which was previously considered to be stable, broke down
under the described conditions. The authors studied the relationship between
the stability of the alloys and their location on the Fe-Cr-C phase diagram.
Stability is determined by not only a certain C and Cr ratio (about 1 : 30) but
also by their absolute content. Under the experimental conditions corrosion

Card 1/2

33895
S/137/62/000/001/171/237
A006/A101

Hydrogen corrosion of ferrochrome ...

was not observed in an alloy with 0.4% C and about 9% Cr, having a $Me_{23}C_6$ carbide constituent. There are 13 references.

Ye. Bukhman

[Abstracter's note: Complete translation]

Card 2/2

18.8300   1138, 1454

23149
S/184/61/000/002/004/008
A110/A033

AUTHORS: Archakov, Yu. I., Candidate of Technical Sciences; Teodorovich, V. P.
             Candidate of Chemical Sciences

TITLE: On the problem of the beginning of hydrogen corrosion of steel

PERIODICAL: Khimicheskoye Mashinostroyeniye, no. 2, 1961, 35 - 38

TEXT: The purpose of this paper was to investigate the conditions marking
the beginning of hydrogen corrosion of carbon and 30ХМА(30KhMA) steels at temper-
atures of 200 - 300°C. The issue is of great importance as, if it is known when
decarbonization is due to set in, it is possible to determine the service life of
equipment and pipes operating under various conditions. The dependence of the
incubation period on the hydrogen pressure and temperature of 35 steel is expres-
sed by

$$\tau_0 = \frac{e^{\frac{13330}{T}}}{p^{3/2} \, C} \qquad (1)$$

Card 1/9

23149

On the problem of the beginning of ....

T - temperature in $^{\circ}K$; p - hydrogen pressure in atm; C - constant ($lgC = 3.4$). For 30XMA (30KhMA) steel these dependencies are

$$\mathcal{T}_0 = \frac{e^{\frac{11\,900}{T}}}{p^{3,1} \, C_1}$$ (2)

C - constant ($lgC_1 = -3.04$). Figure 1 shows incubation values of carbon and 30XMA (30KhMA) steels calculated according to Formula (1) and (2), compared to experimental data. Due to the effect of numerous other factors the temperature limit of the beginning of hydrogen corrosion may vary by 50 - 100°C. N. Inglies and W. Andrews (Ref. 3: "J. Iron and Steel Inst." vol. 53, No. 128, 1933) present results of investigations carried out on 13 mm tubes 56 mm in diameter at 250 - 270°C and 250 atm, after exposure to hydrogen. Steel containing 0.12% C with 15.000 μ^2 grains remained unaffected after 1,200 hours; after 3,200 hours the depth of decarbonization was 3.8 mm. Identical steel with 500 μ^2 grains showed

Card 2/9

23149

S/184/61/000/002/004/008
On the problem of the beginning of A110/A033

no signs of decarbonization after 8,800 hours, which confirms the accuracy of
calculations of the length of the incubation period according to Formula (1), i.e.
10,000 hours for fine-grained steel. According to the same formula, the incuba-
tion period of carbon steel is 50,000 hours at 220°C and 800,000 hours at 170°C.
P. S. Perminov (Ref. 4: "Corrosion and its Prevention", vol. 2, no. 1, 1936)
states that the tendency to fractures grows proportionally to the increasing
carbon content of steel, owing to differing specific volumes of cementite and
ferrite. Ref. 4 also contains data on the begin of hydrogen corrosion of carbon
steel at various temperatures and pressures (Figure 2). From reports contained
in References 3 and 4 follows, that at pressures up to 500 atm the lower temper-
ature limit of hydrogen effect on carbon steel lies around 200°C. These results
have been confirmed by tests carried out by the Gosudarstvennyy Institut Vysokikh
Davleniy, GIVD (State Institute of High Pressures) in 1940. Grade "25" steel
pipes were fully decarbonized after 1.5 years of operation in a nitrogen-hydrogen-
-ammonia medium at 300 atm and 450 - 525°C. Similar corrosion appeared in grade
"20' steel subjects to the same medium at 200 atm. The unreliability of short-
-term tests is demonstrated by means of results obtained by the GIVD with grade
"20" steel, and by a non-specified ammonia plant with carbon steel. According to the

Card 3/9

23149

S/184/61/000/002/004/008
A110/A033

On the problem of the beginning of ...

author's calculations, the incubation period of grade "20" steel should be 10,000 hours at 150 - 250°C and 275 - 300 atm. Data obtained by F. Nauman (Ref. 5, "Steel and Iron", vol. 57, no. 32, 1937) is considered unreliable because of the brief- ness of pertinent tests (100 hours). Production experiments confirm the accuracy of results given in Ref. 4, and established temperature limits and hydrogen pres- sure in respect of various steels listed by G. A. Nelson (Ref. 14: "Trans the ASME", February, 1951). According to 0. van Rossum (Ref. 11:"Chem. Ing. Eng. ug Techn." vol. 25, no 8/9, 1953). Inner stresses and preliminary cold working de- crease the hydrogen resistance of steel, consequently carbon steel should not be used under pressures exceeding 300 atm and temperatures above 220°C. This state- ment is borne out by the findings given in References 4 and 14 and appears in re- spect of smaller machine parts made of fine-grained steel. The longer the soak- ing of samples in hydrogen, the lower the temperatures and pressures at which fractures take place. The use of carbon steel in the shape of coarse-grained large billets is particularly dangerous. Temperatures up to 150°C are considered safe for carbon steel equipment used in hydrogenation plants. For short-term operations at higher temperatures, the strength of machinery and pipe walls should be selected taking into account hydrogen corrosion. The effective power of the

Card 4/9

23149

S/184/61/000/002/004/008
A110/A033

On the problem of the beginning of ....

activated decarbonization process in respect of chromium and molybdenum alloyed steels increases from 7,200 cal/g-atom ("20"steel) to 15,000 cal/g-atom (30KhMA steel). Figure 4 shows the dependency of decarbonization depth Δl on pressure p for various pipe walls: Yu. I. Archakov, (Ref. 15: "Journal of Applied Chemistry", vol. 33, no. 11, 1960) developed an equation linking the depth of decarbonization with pressure, temperature, wall strength and inside radius of a "20" steel pipe

$$\Delta l = Ae^{-\frac{E}{RT}} \tau^a p^n \delta^m R_2^{\mu} \tag{3}$$

Δl - depth of decarbonized layer; T - absolute temperature in $^\circ K$; τ - duration in hours; p - hydrogen pressure in kg/cm^2; δ - strength of walls and machinery casings in mm; R_2 - inside radius of pipe in mm; e - base of natural logarithms; $E = 7,200$ cal/g-atom effective power of activated decarbonization process; $R \approx 1.987$ cal/g-atm $^\circ C$, gas constant; $A = 0.0076$; $a = 0.5$; $n = 1.12$; $m = 0.71$; $\mu = 0.58$. Equation (3) is applicable only after completion of the incubation period, i.e., during the decarbonization process. The empirical equation applies

Card 5/9

23149

S/184/61/000/002/004/008
A110/A033

On the problem of the beginning of ....

to 4, 7, 10 and 12 mm pipes with inside diameters of 4, 8, 10, 16 and 18 mm. According to V.V. Ipatyev et al (Ref. 1: Zhurnal prikladnoy khimii, vol. 31, no. 12, 1958) the kinetic aspect of decarbonization of 30ХМА (30KhMA) steel is expressed by

$$\lg K = -\frac{15,000}{2,3RT} + 0.0034\ p + 1.13 \tag{4}$$

$K = \dfrac{\Delta l}{l\sqrt{\tau}}$, showing the ratio of the decarbonization rate of 30 ХМА(30KhMA)

steel pipes to the pressure and temperature. Equation (4) makes it possible to determine the rate and depth of decarbonization of 24 x 7 mm 30ХМА (30KhMA) pipes and the approximative computation of their service life, depending on operating conditions. All equations are applicable to hydrogen affected steel pipes. Under production conditions the steam-gas mixture contains 50 - 80 % (volumetric) hydrogen; the rest are hydrocarbons which delay hydrogen corrosion. The resistance to hydrogen corrosion of carbon steels exposed to high temperatures and pressures can be improved by addition of strong carbide-forming elements, of which the increase of chromium content proved most effective. Tests proved that a slow de-

Card 6/9

23149

S/184/61/000/002/004/008
A110/A033

On the problem of the beginning of ...

carbonization process takes place already at 200 - 250°C, consequently the safe
operation range for carbon steels in hydrogen media at 300 kg/cm^2 pressure is
limited to temperatures not exceeding 150°C. 30ХМА(30KhMA) chromium-molybdenum
steel can be used in hydrogenation plants and subjected to 300 kg/cm^2 hydrogen
pressures at 300°C. There are 6 figures and 16 references: 10 Soviet-bloc and
6 non-Soviet-bloc. The reference to the English-language publication reads as
follows: G. A. Nelson "Trans the ASME, February 1951; Oil and Gas Journal, vol. 57,
no. 22, 1959.

Card 7/9

26864
S/080/61/034/004/005/012
A057/A129

18.8100   1413, 1418, 2808, 4016

AUTHORS: Archakov, Yu. I., Grebeshkova, I. D., Teodorovich, V. P.

TITLE: Determination of the rate of hydrogen diffusion through 1X18H9T (1Kh18N9T) steel at high temperatures and pressures

PERIODICAL: Zhurnal prikladnoy khimii, v. 34, no. 4, 1961, 821 - 825

TEXT: A method was developed for determining the hydrogen permeability of 1Kh18N9T (AISI 321) steel under high-temperature (up to 1,000°C) and high-pressure (up to 300 kg/cm²) conditions. It was found that the pressure dependence of the hydrogen diffusion rate is parabolic and the temperature dependence is exponential, having a temperature coefficient of 21,650 cal·g^{-1}·atom^{-1}. The method allows diffusion rates through metals at high temperatures and pressures to be determined with sufficient accuracy. It is essential that welding joints can be avoided and the amount of diffused gas can be measured. The present investigation was necessary since literature data refer only to tests at high temperature and low pressure or vice versa. No data are available for high-temperature and high-pressure conditions. In the method presented tubular samples (Figure 1) are used without welding joints and temperature and pressure were kept constant during

Card 1/5

26864
S/080/61/034/004/005/012
A057/A129

Determination of the rate ....

the test. The testing assembly contained the diffusion unit, placed into an electric oven, a high-pressure system and the device for measuring the amount of diffused hydrogen. In all experiments technical grade hydrogen gas was used. The sample (Figure 1) was installed into the diffusion unit by welding the hydrogen gas inlet-tube at point E to the sample and inserting the sample into a vertical cylindrical tube which was placed in the vertical electrical oven. Hydrogen gas thus entered into the sample and diffusion occurred through the walls between C-D (see Figure 1). From the cylindrical tube the diffused hydrogen passed through an outlet-tube to the gas-measuring device. The high-pressure assembly used in the present experiments was described in a previous paper (Ref. 10: Tr. LTI. im. Lensoveta, Goskhimizdat, XXXVIII, 204-215, 1957; Ref. 11: ZhPKh, 32, 12, 2667, 1959). The temperature was regulated during the experiments by means of a ЭДП-17 (EDP-17) electronic potentiometer and registered by a ЭПП-09 (EPP-09) automatic electronic potentiometer. The amount of diffused hydrogen was measured in a device containing for smaller gas amounts a 2 cm^3 microburet calibrated in 0.01 cm^3, while for greater gas quantities a 100 cm^3 buret graduated in 0.2 $cm3$ was used. Measurements were carried out in certain time interval and the amount of diffused gas was estimated per time unit and for normal conditions. The observation made by P.L. Chang et. al. (Ref. 3: J. Iron and Steel Inst., 3, 170, 205, 1952) that

Card 2/5

Determination of the rate ....

stationary gas diffusion is quicker attained by cooling the sample was proved in preliminary experiments in the present work. Thus diffusion characteristics were estimated starting at high temperatures. The present tests were carried out on 6 tubular samples made of 1Kh18N9T steel. The following temperatures and pressures were investigated: 500°C and 300 kg/cm^2, 600 - 800°C up to 200 kg/cm^2, at 900°C up to 100 kg/cm^2, 950°C up to 75 kg/cm^2, and at 1,000°C up to 50 kg/cm^2. The maximum difference in the results between the six investigated samples was 5 %. The results shown in Figure 3 and in a table indicate a parabolic diffusion rate. In Figure 4 the temperature dependence of the diffusion rate is demonstrated. Since all isobars in Figure 4 are parallel to each other, the dependence can be expressed by $V = k \cdot e^{-21650/RT}$. Thus the apparent activation energy, estimated from the inclination angle, is 21,650 cal·g^{-1}·atom^{-1}. H. Bennek and G. Klotzbach (Ref. 1: Stahl und Eisen, 61, 25, 597, 1941) found for the diffusion of hydrogen at high temperature and 1 atm pressure through 18 % Cr, 8.9 % Ni steel an activation energy of 18,850 cal·g^{-1}·atom^{-1}. There are 4 figures, 1 table and 11 references: 4 Soviet-bloc and 7 non-Soviet-bloc.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy institut neftekhimicheskikh protsessov (All-Union Scientific Research Institute of Petrochemical Processes)

Card 3/5

S/737/61/000/000/003/010

AUTHORS: Archakov, Yu.I., Grebeshkova, I.D., Teodorovich, V.P.

TITLE: Hydrogen corrosion of ferrochromium alloys at hydrogen pressure of 400-800 kg/cm^2 and a temperature of 600°C.

SOURCE: Stal', sbornik statey. Ed. by A.M. Yampol'skiy. Moscow. 1961, 424-435.

TEXT: Experimental findings show that the effect of H on ferrochromium (FC) alloys on the stability of the carbide component therein is not controlled by the ratio of the C and Cr contents alone. FC alloys with a C content $\lessgtr 0.4\%$ are H-corrosion resistent at T=600°C and p_H=800 kg/cm^2, provided the Cr content is $\gtrsim 9\%$. Decarbonization of the alloy occurs at the said temperature and pressure, even when only trigonal Cr carbide $(Cr, Fe)_7C_3$ is present. A brief state-of-the-art report on the H-corrosion problem of C steel and means for its minimization are given. The objective of this study is an investigation of the H corrosion of various FC alloys under more severe conditions than those employed in antecedent investigations. The tests defined in the title were conducted for a period of 1,000-4,000 hours. The specimens were fully exposed (on all sides, not only along an interior cavity) to the H pressure. The method used for the investigation of the

Card 1/3

Hydrogen corrosion of ferrochromium alloys...   S/737/61/000/000/003/010

effect of the alloy composition on the H-corrosion process was that of Yu. I. Archakov (Leningradskiy tekstil'nyy institut im. Lensoveta. Trudy, no. 38, Goskhimizdat, 1957), except for a thermostatically controlled electric furnace in which a 36-mm OD, 18-mm ID, tube of 1X18H9T (1Kh18N9T) steel was set to serve as a H-pressurized reaction tank. Fresh H was circulated from one end of the reaction tube once a day to replace any H that might have diffused through the tube and to eliminate any traces of methane that might have formed. The degree of H corrosion was judged before and after soaking by microscopic examination, mechanical testing, and chemical analysis for C. The pre-test heat treatment of various FC-alloy specimens is tabulated. The carbide phase was analyzed chemically and by X-ray before the test. The precipitate was separated electrolytically and chemically, and the Cr and Fe contents were determined in the precipitate and in the separate carbide components. A tabulation of the data obtained by N. M. Popova's method (Karbidnyy analiz stali - Carbide analysis of steel. Oborongiz, 1957) and by N. A. Saverina's method (TsNIITMash, book 36, Mashgiz, 1950) is adduced for 9 alloys, and the two methods are briefly defined. X-ray analysis revealed the presence of the Me_7C_3 with hexagonal lattice, the $Me_{23}C_6$ phase, and some weak lines of an unknown phase. The changes in mechanical properties after H soaking are tabulated for the two series of tests performed at increasing H pressures and longer soaking times. FC alloys with an initial C:Cr ratio of 1:25 and 1:29 were

Card 2/3

Hydrogen corrosion of ferrochromium alloys...   S/737/61/000/000/003/010

totally decarbonized by the H. Alloys with a C:Cr ratio as high as 1:35 were still partly decarbonized. Yet, an alloy with a C:Cr ratio of only 1:24 exhibited only an insignificant surficial decarbonization under the most severe testing conditions. It was concluded that the C:Cr-ratio criterion alone (cf. Inglis, N., Andrews, W., Journal of the Iron & Steel Institute, v. 128, 1933, 383-408, and 2 Soviet references) is inadequate, but that a definite Cr threshold value of 9% is a dependable criterion for the H-corrosion stability of FC alloys containing up to 0.4% C and a $(Cr, Fe)_7C_3$ carbide component. There are 3 figures, 5 tables, and 13 references (9 Russian-language Soviet, 2 English-language, 2 German).

ASSOCIATION: Vsesoyuznyy n.-i. institut neftekhimicheskikh protsessov
              (All-Union scientific research institute for petrochemical
              processes).

Card 3/3

39074
S/080/62/035/006/009/013
D204/D307

11 1220
11.3110

AUTHOR: Archakov, Yu. I.

TITLE: The effect of alloying elements on the stability of
             steels to hydrogen

PERIODICAL: Zhurnal prikladnoy khimii, v. 35, no. 6, 1962,
             1280-1285

TEXT: The stability of steels containing 0.15 - 0.23 C, 0.14 -
0.38 Si, 0.38 - 0.50 Mn, 0.18 - 0.25 Ni, 0 - 0.11 Cu, 0.022 -
0.036 S and 0.001 - 0.022% P, alloyed with Cr, W, V and Ti was
studied at 600°C under pressures of H_2 equal to 400 - 800 kg/cm^2,
over 1000 - 4000 hours. The stability was assessed by microscopic
examination, measurement of mechanical properties and C contents,
before and after the experiments. Phase analyses for carbides
were also carried out. 4000-hour tests at 800 kg/cm^2 showed that
steels containing ~0.2% C were unstable to H_2 if the Cr contents
were 3.0, 4.5 or 5.4%, but were stable if Cr >8.4%. The important

Card 1/3

The effect of alloying ...

S/080/62/035/006/009/013
D204/D307

factors in this context are the nature of the carbide phase; thus cementite containing Cr increased the stability whilst increasing the Fe in $(Cr, Fe)_7C_3$ lowered it. The greatest stability was shown by steels containing $(Cr, Fe)_{23}C_6$. In the case of W, V or Ti additions, steels containing 0.16% C and 1.97% V or 0.94% Ti were stable in H_2 at 800 kg/cm^2 over 1000 hours, whilst those containing 0.4, 0.7, 1.54% W or 0.45% V were largely decarbonized. Partial decarbonization took place in steels with 0.48% Ti and 0.98% V under the same conditions. The carbide phases in the W steels were $(Fe, W)_3C$ and/or $(W, FE)_{23}C_6$ and in the unstable V steels $(Fe, V)_3$ and $(V, Fe)_4C_3$. The stable V and Ti steels contained $(V, Fe)_4C_3$ (alone) and TiC respectively. In these steels cementite loweres, therefore, the stability towards H_2. There are 1 figure and 4 tables.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy institut

Card 2/3

The effect of alloying ...

S/080/62/035/006/009/013
D204/D307

39074

neftekhimicheskikh protsessov (All-Union Scientific
Research Institute of Petrochemical Processes)

SUBMITTED: June 22, 1961

Card 3/3

L 19303-63   EWP(q)/EWT(m)/BDS   ASD/AFFTC   JD
ACCESSION NR: AR3006906   S/0137/63/000/007/I053/I053

SOURCE: RZh. Metalurgiya, Abs. 71363

AUTHOR: Archakov, Yu. I.; Grebeshkova, I. D.

TITLE: Hydrogen corrosion of alloyed steel

CITED SOURCE: Vestn. tekhn. i ekon. inform. N-i. in-t tekhn.-ekon. issled Gos.
kom-ta Sov. Min. SSSR po khimii, no. 12, 1962, 26-31

TOPIC TAGS: corrosion, hydrogen corrosion, alloyed steel, ferro-chromium steel,
hydrogen stability, carbide, interstitial carbide

TRANSLATION: The influence of Cr, W, V, and Ti on the stability to hydrogen
corrosion of ferro-chromium steel was studied, with Cr (1.45-18.8%) and C
(0.11-0.72%) contents in various ratios. Heat-treated samples were tested under
the influence of H_2 for 1000-4000 hours at pressures of 400-800 kg/cm^2 and 600C.
The deciding factors responsible for the hydrogen stability of the steel are the
nature of the carbide phase of the steel, the presence of other elements dissolved
in the carbide component, and the absence of cementite in the steel. The greatest

Card 1/2

L 19303-63
ACCESSION NR: AR3006906

hydrogen stability is possessed by steels with carbides of the "interstitial" type (TiC and VC), as well as with chromium carbides of the type of $Cr_{23}C_6$. Bibliography of 13 titles. N. Lukashina.

DATE ACQ: 12Aug63   SUB CODE: ML   ENCL: 00

Card 2/2

ARCHAKOV, Yu.I.; GREBESHKOVA, I.D.

Effect of addition alloys on the prolonged hydrogen resistance of steel.
Issl. po zharoproch. splav. 10:305-313 '63.   (MIRA 17:2)

ACCESSION NR: AT4013970

S/2659/63/010/000/0305/0313

AUTHOR: Archakov, Yu. I.; Grebeshkova, I. D.

TITLE: Influence of alloying elements on the long-term hydrogen stability of steel

SOURCE: AN SSSR. Institut metallurgii. Issledovaniya po zharoprochny*m splavam, v. 10, 1963, 305-313

TOPIC TAGS: hydrogen stability, alloying element, hydrogen, chromium, tungsten, vanadium, niobium, titanium, steel, steel stability

ABSTRACT: Steel strength drops significantly under the physical and chemical action of hydrogen penetration, leading to the dissociation of the carbide phase and to decarbonization. The present investigation considers the influence of separate alloying elements (cr, W, V, Nb, Ti), and also of the combined action of Cr and Mo, Cr and W, Cr and Nb, Cr and V, Cr and Ti on the hydrogen stability of steel at a temperature of 600C, hydrogen pressure of 800 atm and test duration of 1,000-4,000 hours. It was shown that under conditions of high temperature inter-action with hydrogen, steel with 0.15%C is not decarbonized when it contains 8.4% Cr, while steel with 0.4%C remains unchanged with 9.5% Cr, i.e. when all carbon

Card 1/2

ACCESSION NR: AT4013970

is in a carbide of the (Cr, Fe) $23C_6$ type. Second, under a hydrogen pressure of 800 atm and temperature of 600C for 1,000 hours the steels are completely de-carbonized (content: 0.2%C, with addition of 0.4%W, 0.75%W, 1.57%W, or 0.48%V). Under the same conditions steel with approximately 0.2%C and 3% Cr is decarbonized with up to 0.48%V, 1.5% Mo and 1.5%W. Third, under the influence of hydrogen, the carbon content is not lowered in steels containing approximately 0.2%C with additions of 0.98% Ti and 1.97%V or in steels containing 0.2%C, 3% Cr, 1.5%V, 2% Nb, and 2%T. Fourth, the main factor ensuring the durability of the hydrogen stability of steel is the type of carbide phase. Steel is not decarbonized when the entire carbon content is chemically united in TiC and VC carbides or chromium carbide (Cr, Fe) $23C_6$. Orig. art. has: 1 chemical formula, 4 figures, and 3 tables.

ASSOCIATION: Institut metallurgii AN SSSR (Institute of Metallurgy AN SSSR)

SUBMITTED: 00   DATE ACQ: 27Feb64   ENCL: 00

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

Card   2/2

ACCESSION NR: AR4041619   S/0137/64/000/005/I071/I071

SOURCE: Ref. zh. Metallurgiya, Abs. 5I410

AUTHOR: Archakov, Yu. I.

TITLE: Hydrogen corrosion of steel

CITED SOURCE: Sb. Vliyaniye vodoroda na sluzhebn. svoystva stali. Irkutsk, 1963, 6-21

TOPIC TAGS: steel, steel corrosion, corrosion, hydrogen corrosion

TRANSLATION: Questions of beginning of hydrogen corrosion of steel, influence of thickness of wall, stresses and alloying elements on hydrogen stability of steel are con-sidered. Results are presented which allow us tentatively to calculate magnitude of incubation period for steel 20 and 30KhMA at 200 - 600° and with pressures of H₂ of 100 - 500 kg/cm². Increase of thickness of wall of pipes increases speed of decarbonizing of steel. With stresses, causing plastic flow of metal, the .

Card 1/2

ACCESSION NR: AR4041619

speed of process of decarbonizing sharply increases. It was determined that steel with content of 8% Cr and 0.15% C is hydrogenstable at a temperature of 600° and with pressure of H_2 of 800 kg/cm^2 and is decarbonized with smaller content of Cr. Lowering of strength and ductile properties of steel in given conditions is observed only with its decarbonizing. It was shown that under pressure of H_2 of 800 kg/cm^2, temperature of 600° and duration of experiments of 1000 hours, steel with 0.16 - 0.18% C and additions 0.4-0.74; 1.57% W and 0.45% V turned out to be completely decarbonized, and steel with 1% V, 0.48% Ti and 0.58% Nb — partially. Steel with content of 0.16% C and additions of 0.94% Ti and 1.96% V in the given conditions turned out to be stable to hydrogen influence. Bibliography: 14 references.

SUB CODE: MM

ENCL: 00

Card 2/2

L 15176-65   EWT(m)/EWP(w)/EPF(c)/EPF(n)-2/EWA(d)/EWP(t)/EWP(b) F -4/Pu-4 SSD/
AS (f)-2/ASD(m)-3/AFMDC/AFTC(p)   JD/WW/ C WL WLK

ACCESSION NR: AT4045964   S/0000/64/000/000/0019/0043

AUTHOR: Archakov, Yu. I.; Grebeshkova, I. D.

TITLE: Hydrogen resistant steels of low scarcity

SOURCE: Novyye materialy* v mashinostroyenii (New materials in machinery
manufacturing). Moscow, Izd-vo Mashinostroyeniye, 1964, 19-43

TOPIC TAGS: steel, alloy steel, hydrogen resistance, embrittlement, corrosion,
decarbonization, stainless steel, carbon diffusion

ABSTRACT: Processes taking place under hydrogen pressure are usually carried out
at elevated temperatures, so that both heat resistance and hydrogen resistance
have to be considered in evaluating materials working in a hydrogen-containing
environment. The two main problems are hydrogen corrosion (decarbonization) and
hydrogen embrittlement, the former being the most harmful. In the present paper,
the influence of alloying elements on the hydrogen resistance of steel was investi-
gated on specimens subjected to hydrogen at various pressures at 600C, and for
various test durations. Mechanical tests performed before and after heating in
hydrogen showed the corresponding changes in physical properties. Four series
of tests were carried out: (1) variation of the chromium content in chromium
steels (hydrogen pressure 400--800 kg/cm² for 1000--4000 hours); (2) variation

Card 1/3

L 15176-65

ACCESSION NR: AT4045964

6

of the tungsten, columbium, vanadium, and titanium content (800 kg/cm^2; 1000 hours); (3) variation of the molybdenum, tungsten, columbium, vanadium, and titanium content in steel with 0.2% C, 3% Cr (400--750 kg/cm^2; 1000--2000 hours); (4) variation of the silicon, molybdenum, tungsten, vanadium, and titanium content in steel with 0.2% C, 6% Cr (800 kg/cm^2; 4000 hours). From the obtained test results it is concluded that the hydrogen resistance of steel is determined mainly by the type of carbide phase, the character of the interatomic ties between carbon and the alloying element, and secondarily by the velocity of carbon diffusion in chromium-containing ferrite. Tests showed that additions of Cr, Mo, W, V, Cb, and Ti increase the stability of the carbide phase; at the same time, the velocity of carbide phase coagulation decreases. The degree of dispersion of the carbide component is apparently not important. To stabilize steel with 0.2% C, 3-6% Cr against hydrogen corrosion (at 600 C), the addition of stronger carbide-forming elements such as V, Cb, and Ti, or the addition of more than 9% Cr, is required. However, at the present time, the authors are limiting their recommendations for the conditions 600C and 800 kg/cm^2. Under such conditions, not less than 8.4% Cr should be added to steels with 0.2% C (or less) and not less than 10% Cr should be added to steels with 0.2-0.4% carbon. There are not yet sufficient data available to establish a quantitative correlation between the temperature and pressure, on the one hand, and the maximum hydrogen resistance on the other. Orig. art. has: 12 figures and 12 tables.

Card 2/3

L 15176-65
ACCESSION NR: AT4045964

ASSOCIATION: none

SUBMITTED: 16May64   ENCL: 00   SUB CODE: MM

NO REF SOV: 009   OTHER: 004

Cord   3/3

L 7054-66   EWT(m)/EWP(w)/EWA(d)/T/EWP(t)/EWP(z)/EWP(b)   IJP(c)   MJW/JD/RM/WH

ACC NR: AP5028201

SOURCE CODE: UR/0314/65/000/009/0026/0028

AUTHORS: Archakov, Yu. I. (Candidate of technical sciences); Grebeshkova, I. D. (Engineer)

ORG: none

TITLE: Investigation of the tendency towards carburization of steels in methane at elevated temperatures and pressures

SOURCE: Khimicheskoye i neftyanoye mashinostroyeniye, no. 9, 1965, 26-28

TOPIC TAGS: carburization, alloy steel, methane, steel, iron/ 12Kh1MF steel, NM1 steel, 7475 steel,

ABSTRACT: The tendency of a number of chromium and carbon steels towards carburization in methane at 600C and 50-200 atm pressure was investigated. The experimental procedure followed was that of Yu. I. Archakov, I. D. Grebeshkova, and V. P. Teodorovich (Sb. "Stal'", M., Metallurgizdat, 1961). The chromium steels investigated contained from 1.25 to 14% Cr. The carbon steels were of type 10, 20, and 30. In addition, the behavior of technical iron containing 0.05% C was also investigated. The elemental analysis of the steels is tabulated, and the experimental results are presented graphically (see Fig. 1). It was found that carburization of steel 7475 decreases the ductility but increases the strength of the steel. Carburization of other steels (containing 6.9-14% Cr) caused an insignificant decrease in the strength

Card 1/2

UDC: 66.046.56:547.211

L 7054-66

ACC NR: AP5028201
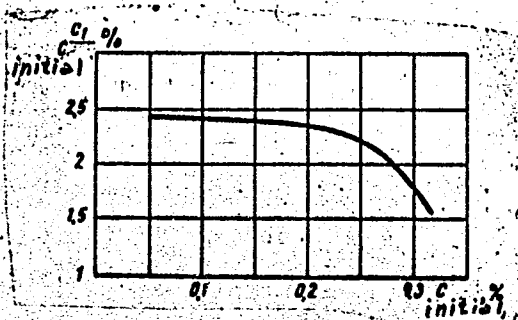
Fig. 1. Effect of carbon content on carburization of nonalloyed
steel (p_{CH_4} = 50 atm)

of the steel. It is concluded that low-alloy steels of type 12Kh1MF containing
strongly carbide-forming elements exhibit a pronounced tendency toward carburization.
The work was undertaken at VNIIneftekhim. Orig. art. has: 2 tables and 2 graphs.

SUB CODE: GC/ SUBM DATE: none/ ORIG REF: 002/ OTH REF: 001

Card 2/2

ARCHAKOV, Yu.I.

Protection of metals from the effect of hydrogen. Zashch. met. 1
no.5:587-590 S-0 '65.   (MIRA 18:9)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut neftekhimicheskikh
protsessov.

L 57735-65   EWT(m)/EWP(w)/EPF(c)/EWA(d)/EPR/T/EWP(t)/EWP(b)/EWA(c)   Pr-4

TJP(c)   JD/WB/EM

ACCESSION NR: AP5017096   UR/0032/65/031/007/0873/0875
                                                    620.194   35
                                                                               32
AUTHOR: Archakov, Yu. I.; Golubovskiy, B. S.; Il'ichev, V. I.   B

TITLE: Method of investigating the effect of stress on the gas corrosion of steel

SOURCE: Zavodskaya laboratoriya, v. 31, no. 7, 1965, 873-875

TOPIC TAGS: stressed state, volumetric stress, plane stress, stress test, corro-
sion test, decarburization rate, decarburized steel, steel corrosion, gas corro-
sion, corrosive medium

ABSTRACT: The authors could not find in the literature any information on the ef-
fect of stress on the rate of the chemical, gas corrosion of metals (in particular,
on the rate of the decarburization of steel by hydrogen in the presence of high
temperatures and pressures). To fill this gap the authors tried to develop tech-
niques of investigating the effect of stresses on the decarburization rate of steel
at temperatures of up to 500°C and hydrogen pressure of up to 500 kg/cm². The ex-
periments were performed in a specially designed setup (Fig. 1). Clamped between
two nipples 1 is the specimen 2 (a plate of pre-annealed steel 50 mm in diameter,
5 ± 0.1 mm thick), with the aid of flanges 3 and bolts 4. The working diameter of

Card 1/5

L 57735-65

ACCESSION NR: AP5017096

the region of contact between the gas and specimen is 30 mm. Washers 5, inserted in the nipple grooves, serve to improve the clamping tightness. One nipple is linked to a high-pressure hydrogen system and the other, to a high-pressure nitrogen system. Pressure in both parts of the apparatus is measured with the aid of standard manometer 6. Chromel-alumel thermocouples 7 and portable potentiometers 8 serve to measure the test temperature and are regulated by means of electronic potentiometer 9 connected to the circuit of heating furnace 10. The setup is provided with cocks 11 for regulating gas pressure. Commercial hydrogen at a fixed pressure of 200 kg/cm^2 is used as the corrosive-aggressive medium, while nitrogen at the same and higher pressures is used to produce stresses in the investigated plate. The whole setup is placed in an electric furnace and heated to 500°C. Each experiment lasted 24 hr. After each experiment microsections of the specimens were examined and found to display a distinct decarburized zone in the region of exposure to hydrogen. The material on the specimen surface in contact with the aggressive medium (H$_2$) experiences two forms of stressed state: volumetric (due to the pressure of hydrogen and the counterbalancing pressure of nitrogen) and plane (due to bending of the plate by the excess pressure of nitrogen); the bending causes tangential and radial stresses which can be computed from the corresponding formulas. The principal stresses in the material of the specimens equal the algebraic sum of the rated conditional stresses produced by both forms of

Card 2/5

L 57735-65
ACCESSION NR: AP5017096

stressed state and the rated conditional (so called, because in the course of ex-
periment the stresses change owing to the decarburization of steel) stresses can
be determined from them on the basis of different strength theories. Tests showed
that as the conditional stresses increase the measured depth of the decarburized
layer increases also. Fig. 2 presents a curve of the depth δ of decarburized lay-
er as a function of stresses σ_{II}. As can be seen from this curve, increase in the
stresses accelerates the process of corrosion, thus accelerating the decarburiza-
tion rate of steel. Orig. art. has: 2 figures.

ASSOCIATION: Leningradskiy tekhnologicheskiy institut im. Lensoveta (Leningrad
Technological Institute); Vsesoyuznyy nauchno-issledovatel'skiy institut nefte-
khimicheskikh protsessov (All-Union Scientific Research Institute of Petrochemical
Processes)

SUBMITTED: 00   ENCL: 02   SUB CODE: MM, MT

NR REF SOV: 008   OTHER: 000

Card 3/5

L 1610-66   EWT(m)/EWP(w)/EWA(d)/T/EWP(t)/EWP(z)/EWP(b)/EWA(c)   MJW/JD

ACCESSION NR: AP5021666

UR/0080/65/038/008/1754/1760
621.0-419

AUTHOR: Archakov, Yu. I.

TITLE: Hydrogen resistance of bimetals

SOURCE: Zhurnal prikladnoy khimii, v. 38, no. 8, 1965, 1754-1760

TOPIC TAGS: bimetal, steel, stainless steel, hydrogen embrittlement, permea-
bility measurement, gas diffusion/ EI496 steel, 1Kh18N9T steel

ABSTRACT: Bimetals with a protective layer of steels EI496 and 1Kh18N9T are
widely used in the chemical and petroleum industries. It is known that penetra-
tion of hydrogen into these steels starts at 300 C. With increased hydrogen
pressure the hydrogen starts penetration at a lower temperature. This article
is a theoretical study of the hydrogen permeability of bimetals in which mathema-
tical deductions are compared to the experimental data of other investigators. It
is concluded that at high temperatures and pressures, a layer of stainless steel
decreases the hydrogen pressure at the welding boundaries of the individual com-

Card 1/2

L 1610-66
ACCESSION NR: AP5021666

ponents of the bimetal and constitutes a barrier to elimination of carbon from the metal. An equation is derived which permits calculation of the pressure at the boundary of the two metal layers as a function of change in external pressure, the hydrogen permeability constants of the individual components of the bimetals, and their thicknesses. Orig. art. has: 18 formulas, 2 figures and 3 tables

ASSOCIATION: None

SUBMITTED: 08Aug64   ENCL: 00   SUB CODE: MM

NR REF SOV: 009   OTHER: 007

Card 2/2

ARCHAKOV, Yu.I., kand.tekhn.nauk; GREBESHKOVA, I.D., inzh.

Studying the tendency of steel toward carburizing in methane at increased temperatures and pressures. Khim. i neft. mashinostr. no.9:26-28 S '65.

(MIRA 18:10)

ACC NR: AP6028096   SOURCE CODE: UR/0314/66/000/006/0027/0032

AUTHOR: Archakov, Yu. I. (Candidate of technical sciences); Grebeshkova, I. D. (Engineer)

ORG: none

TITLE: Hydrogen resistance of two layer steels

SOURCE: Khimicheskoye i neftyanoye mashinostroyeniye, no. 6, 1966, 27-32

TOPIC TAGS: hydrogen embrittlement, gas diffusion, metal cladding

ABSTRACT: Three main methods are presently employed for the protection of two layer metals from the effects of hot hydrogen under pressure; 1) the introduction of strongly carbide forming elements (Cr, Mo, V, Nb, Ti); 2) a reduction in the working parameters (temperature and pressure); 3) cladding or lining with metals which have a high resistance to hydrogen penetration. The present article explores the possibility of protecting metals from the action of hydrogen by the formation of barriers on the surface of the metals. The article gives a mathematical treatment of the subject, based on the first law of diffusion in the differential form:

$$v = -D\frac{\partial c}{\partial x}, \qquad (1)$$

Card 1/2   UDC: 621.9-419:620.193.55.001.5

. L 35035-57

ACC NR: AP6028096

where v is the rate of penetration of hydrogen through a unit of surface of a two layer metal, with steady state flow and a concentration gradient of $\partial c/\partial x$. Based on literature data, the article gives extensive tables showing the rate of hydrogen penetration into a large number of steels and alloys. It is concluded that a cladding layer can protect the base metal from hydrogen penetration. This takes place in the following manner: the stainless layer of the two layer steel, having a smaller diffusion capacity, reduces the hydrogen pressure (its concentration) at the boundary between the metals, and promotes the removal of the production of reaction, that is, it promotes the process of decarbonization. Orig. art. has: 8 formulas, 5 figures, and 6 tables.

SUB CODE: 11, 20/ SUBM DATE: none/ ORIG REF: 014/ OTH REF: 007

Card 2/2

ARCHAKOVA, E.V.

Treatment of angina in children through district-wide medical
service. Pediatriia no.8:82-84 '61.   (MIRA 14:9)
                    (TONSILLITIS)

FLORINSKIY, F.V., prof.; VOLOSHINA, L.P., dots.; LYAKHOVITSKIY, S.I., kand.
tekhn.nauk; SHIROCHENKO, Ye.V., dots. [deceased]; ARCHAKOVA, L.A.,
inzh.; GVAY, T.B., inzh.; MURZINA, Z.I., inzh.

Results of research on screen vibrating in the horizontal horizontal
plane. Izv.vys.ucheb.zav.; gor.zhur.   no.2:167-170   '60.

(MIRA 14:5)

1. Dnepropetrovskiy gornyy institut.
(Screens (Mining))

ARCHAKOVA, L.A., inzh.; KRYUKOV, B.I., kand. tekhn. nauk; RYKHAL'SKIY, Yu.A.,
    kand.tekhn. nauk

Dynamics of vibratory machines with planetary-type binarmonic vibrators.
Izv.vys.ucheb.zav.;gor.zhur. 7 no.9:140-143 '64.

ARCHAKOVA, L.I.

Further analysis of the myenteric reaction. Dokl. AN BSSR 7 no.3:
208-211 Mr '63.   (MIRA 16:6)

1. Institut fiziologii AN BSSR. Predstavleno akademikom AN BSSR
I.A.Bulyginym.

(Intestines)

ARCHAKOVA, L.I.

    Intramural mechanisms of the myenteric reaction of the small
intestines. Vestsi AN BSSR.Ser.biial.nav. no.3:98-106 '62.
                                       (MIRA 15:12)
                   (INTESTINES—INNERVATION)

ARCHAKOVA, L.I.

Comparative characteristics of the reception of the serous and mucous membranes of the jejunum in dogs. Vestsi AN BSSR. Ser. biial. nav. no.4:103-107 '62.   (MIRA 17:8)

KITAYGORODSKIY, I.I., doktor tekhn. nauk, prof.; ZHITOMIRSKAYA, E.Z.;
ARCHAKOVA, R.A.; MIKHAYLOVA-BOGDANSKAYA, Z.A.; BARINOVA, A.F.

Investigating methods of reducing the volumetric weight of foam
glass. Trudy VNIIStekla no.37:3-11 '57.   (MIRA 11:1)
                    (Glass, Cellular)

GORYUSHINA, V.G.; ARCHAKOVA, T.A.

Rapid volumetric determination of beryllium in alloys. Zav.lab. 22
no.5:532-535 '56.   (MLRA 9:8)
          (Beryllium--Analysis) (Titration)

5(2)   SOV/32-25-7-5/50
AUTHORS: Goryushina, V. G., Archakova, T. A.

TITLE: New Volumetric Method for the Determination of Uranium (Novyy
                ob"yemnyy metod opredeleniya urana)

PERIODICAL: Zavodskaya laboratoriya, 1959, Vol 25, Nr 7, pp 789 - 790 (USSR)

ABSTRACT: The new method of determining uranium was elaborated in much
                the same way as the determination of beryllium (Refs 10, 11).
                The method is based upon a precipitation of uranium in the pre-
                sence of trilon B with sodium arsenate and a subsequent iodo-
                metric titration of the

                AsO_4^{3-} - ion bound with uranium. It was experimentally determined
                that the crystalline precipitate which is precipitated to acetic
                uranium solution by addition of sodium arsenate (pH~3) possesses
                constant composition ($UO_2:AsO_4$= 1:1). The results of the iodo-
                metric arsenic titration and conversion into uranium (Table 1)
                confirmed the applicability of this method to the determination
                of uranium. The method described has a high selectivity since
                the elements such as the bivalent metals Fe, Al, Bi, and V, Th,
Card 1/2   Mo do not disturb the determination, and Ti by addition of Per-

New Volumetric Method for the Determination of Uranium   SOV/32-25-7-5/50

hydrol and Zr by addition of fluoboric acid (Table 2) can be bound. By addition of a larger quantity of precipitant the influence of the phosphates can also be eliminated. A process of analysis is described. There are 2 tables and 1 Soviet reference.

ASSOCIATION: Gosudarstvennyy nauchno-isoledovatel'skiy institut redkikh i malykh metallov (State Scientific Research Institute for Rare and Minor Metals)

Card 2/2

S/032/61/027/007/001/012
B110/B203

AUTHORS: Goryushina, V. G., Romanova, Ye. V., and Archakova, T. A.

TITLE: Colorimetric method for determining zirconium in alloys

PERIODICAL: Zavodskaya laboratoriya, v. 27, no. 7, 1961, 795-797

TEXT: The methods, much improved recently, for determining zirconium, e.
g., with pyrocatechol violet, xylenol blue, and Arsenazo III, are subject
to the effect of various elements contained in the alloys (Table 1). Tin
can be used as a reducing agent, particularly in strongly acid media in
which hydroxylamine and ascorbic acid are poorly efficient. In the Arsenazo
III method, the presence of larger amounts of elements usually admixed to
Zr is permissible. In strongly acid medium (2 N HCl), the effect of all
bivalent, and many other, elements is eliminated. At a Zr content $\geq 0.1\%$,
Zr may be directly determined with Arsenazo III without removal of Ti
(Table 2). The results obtained agree with control tests performed with
pyrocatechol violet. The Ti content may be ≤ 10 mg. At a Zr content of
0.2%, the method is applicable to vanadium and ferrous alloys. In the

Card 1/6

latter, the iron is previously reduced by hydroxylamine. In Al and Mg alloys, there is no lower limit of the Zr content. With introduction of the same Cu amount of the analytic solution into the zero solutions, a Zr content of up to 0.005% can be determined without Cu separation since the optical density of solutions with 5-25γ Zr is preserved in the presence of 50, 100, and 200 mg of Cu. Dissolution in H_2SO_4 is required for Zr alloys on Cu basis with elevated Cr content. Since a content of only $\leq$ 100 mg of SO_4^{2-} is permissible for the Arsenazo III method, the Zr must be (1) precipitated with NH_3 (at low Zr content in the presence of 5 mg of Al or Fe as collector), or (2) determined colorimetrically by means of xylenol orange. Authors' tests showed that $\leq$ 10 mg of Cu did not disturb the determination of 10-60γ of Zr in 50 ml of 0.5 N H_2SO_4 with an addition of 2 ml of 0.1% dye solution. The determination may be conducted without Cu separation with an accuracy of 0.01%. For Zr determination in refractory alloys be means of xylenol orange, it is recommended to separate Fe, Ni, and other elements on the Hg cathode with subsequent precipitation of the

Card 2/4

Colorimetric method for determining ...

S/032/61/027/007/001/012
B110/B203

hydroxides by means of NaOH. Even in the presence of 5 mg Nb (50 ml of 2 N HCl, 1 ml of 0.1% dye solution), 10-12 γ Zr can be determined by means of Arsenazo III. With lower Zr content and a high excess of the reagent, the latter may react with Nb; the result of the Zr analysis may already be distorted at a niobium content of 100 γ. 0.1-0.2 g of Al, Ti, etc., alloy is dissolved in HCl or, (Cu alloy), HNO_3. In the presence of Ti, a mixture with H_2O_2 is prepared and boiled to discoloring. Then, it is acidified to 2 N HCl. Part of the solution with 5-25 γ of Zr is diluted to 10 ml by means of 2 N HCl, and heated to boiling. In the case of Fe content, hydroxylamine is added until the yellow color disappears. 3 ml of 1% Arsenazo III solution is admixed, and filled up with 2 N HCl to 50 ml; then, the optical density is compared to that of the zero solution (equal gelatin and Arsenazo III amounts in 50 ml of 2 N HCl). To prepare the reagent solution, 10 mg of Arsenazo III in 50-60 ml of H_2O is diluted with 15 ml of HCl (1:5), and filled up with H_2O to 100 ml. In the presence of Cu in the analytic solution, Cu salt solution in 2 N HCl is added to the zero solution in a quantity corresponding to the Cu amount

Card 3/6

Colorimetric method for determining ...   S/032/61/027/007/001/012
B110/B203

in the aliquot analytic solution. Measurements were made with an ФЭК-M
(FEK-M) photoelectric colorimeter and red light filter in a cuvette, 2 cm
long. The first two authors (Ref. 3: Zavodskaya laboratoriya, XXVI, 415
(1960)) plotted a calibration curve for 5-25γ Zr in 50 ml of 2 N HCl.
There are 2 tables and 7 references: 3 Soviet-bloc and 4 non-Soviet-bloc.
The reference to the English-language publication reads as follows: Ref.
6: G. Milner, J. Edwards. Anal. Chim. Acta, 13, 230 (1955).

ASSOCIATION: Gosudarstvennyy nauchno-issledovatel'skiy i proyektnyy in-
               stitut redkometallicheskoy promyshlennosti (State Design and
               Planning Scientific Research Institute of the Rare Metals
               Industry)

Table 1. Effect of various elements on colorimetric zirconium deter-
minations (measurement by means of ФЭК-M(FEK-M) colorimeter).
Legend: (1) Reagent, (2) conditions of determination, (3) optimum
concentration of Zr in 50 ml, γ, (4) permissible amount of the element, mg,
(5) pyrocatechol violet, (6) xylenol orange, (7) Arsenazo III, (8) acetate
buffer pH $\approx$ 5.2+Trilon B.

Card 4/6

GORYUSHINA, V.G.; ARCHAKOVA, T.A.

Colorimetric determination of calcium with acid chrome blue K.
Zav.lab. 28 no.7:796-798 '62.   (MIRA 15:6)

1. Gosudarstvennyy nauchno-issledovatel'skiy i proyektnyy institut
redkometallicheskoy promyshlennosti.
                    (Calcium—Analysis)

82622
S/180/60/000/004/017/027
E193/E483

18.1210

AUTHORS: Archakova, Z.N., Romanova, O.A. and
               Fridlyander, I.N.   (Moscow)

TITLE: Investigation of the Properties of Alloys of the
               Al-Cu-Li-Cd-Mn System at Room and Elevated Temperatures

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh
               nauk, Metallurgiya i toplivo, 1960, No.4, pp.106-110

TEXT: The alloys studied in the course of the investigation
described in the present paper contained 0 to 3% Li and 4.0 to
6.5% Cu, the content of other alloying additions being constant
and amounting to 0.1% Cd, 0.6% Mn and no more than 0.3% each of
Fe and Si.   The mechanical properties of the alloys were
determined after 4 types of thermal treatment: (1) solution
treatment, i.e. quenching from 525 to 535°C;   (2) annealing,
i.e. cooling from 430 to 150°C in 7 days;   (3) ageing at room
temperature for 7 days;   (4) ageing at temperatures between 150
and 200°C for 12 h at 200°C and 16 h at other temperatures.
The mechanical tests were carried out both at room and elevated
(200 to 250°C) temperatures on specimens machined from extruded
rod and appropriately heat-treated.   It was found that
Card 1/3

82622

S/180/60/000/004/017/027

E193/E483

Investigation of the Properties of Alloys of the Al-Cu-Li-Cd-Mn System at Room and Elevated Temperatures

simultaneous introduction of 0.9 to 1.4% Li and 0.1% Cd greatly increased the strength of the Al-Cu-Mn alloys in the age-hardened condition and, on the basis of the results obtained, the composition of a new, high strength rod alloy, suitable for high temperature service, was determined. The nominal composition of the new alloy VAD23 is: 5.4% Cu, 1.25% Li, 0.6% Mn, 0.15% Cd, remainder Al: its U.T.S. and 0.2% proof stress at 20°C are 60 and 54 kg/mm² respectively. Regarding its room-temperature strength, the new alloy resembles the high strength, Al-Zn-Mg-Cu alloys (type V95); its mechanical properties at high temperatures (150 to 250°C) are better than those of any known Al-base alloy of this type and, what is particularly important, the alloy retains its strength after long periods at these temperatures. Thus, the U.T.S. and elongation δ of the VAD23 alloy, held at 200°C for 0.5 h, were 46.9 kg/mm². and 6.3% respectively, the corresponding figures for the V95 alloy being 40 kg/mm² and 12.6%. After 100 h at the temperature, U.T.S. and δ of the VAD23 alloy were still

Card 2/3

82622

S/180/60/000/004/017/027
E193/E483

Investigation of the Properties of Alloys of the Al-Cu-Li-Cd-Mn
System at Room and Elevated Temperatures

42.4 kg/mm2 and 6.3%, whereas U.T.S. of the V95 alloy fell to
19.3 kg/mm2, its 6 increasing to 19.8%. The corrosion
resistance of the new alloy is not impaired by its lidium content;
its specific gravity (2.73 g/cm3) is slightly lower and its
molecules of elasticity slightly higher than those of the standard
aluminium alloys D16 and V95. There are 5 figures, 2 tables and
10 references: 2 Soviet, 5 English and 3 German.

SUBMITTED: March 17, 1960

Card 3/3

FRIDLYANDER, I.N. (Moskva); ROMANOVA, O.A. (Mosk⌒⌐); ARCHAKOVA, Z.N.
    (Moskva); Prinimali uchastiye: REZNIK, P.G.; LEBEDEVA, N.S.

Mechanical properties of heat-resistant aluminum alloys with
lithium and cadmium, Izv.AN SSSR. Otd.tekh.nauk. Met.i topl.
no.4:82-89 Jl-Ag '62.   (MIRA 15:8)
            (Aluminum alloys--Testing)
                    (Heat-resistant alloys--Testing)

FRIDLYANDER I.N.: ANDREYEV, A.D.; PAVLOVA, I.K.; ROMANOVA, O.A.; ARCHAKOVA, Z.N.; Prinimali uchastiye: FOMIN, K.N.; POTAPOVA, V.I.; KALININA, Ye.N.

Selecting a technology and studying the effect of techno-logical factors on the structure and properties of the VAD23 alloy. Alium. splavy no.3:182-193 '64.   (MIRA 17:6)

ACCESSION NR: AT4037659   S/2981/64/000/003/0182/0193

AUTHOR: Fridlyander, I. N.; Andreyev, A. D.; Pavlova, I. K.; Romanova, O. A.; Archakova, Z. N.

TITLE: Selection of a fabrication process and a study of the effects of technological factors on the structure and properties of alloy VAD23

SOURCE: Alyuminiyevy*ye splavy*, no. 3, 1964. Deformiruyemy*ye splavy* (Malleable alloys), 182-193

TOPIC TAGS: aluminum alloy, alloy VAD23, alloy structure, alloy mechanical property, alloy hardening, alloy aging, alloy casting, alloy hot pressing, alloy hot rolling, alloy cold rolling, alloy forging, alloy semiproduct aniso- tropy, high strength aluminum alloy, heat resistant aluminum alloy

ABSTRACT: Ingots (diameter 300 mm, length 1000 mm) of alloy VAD23 were factory dip-cast (flux refined, kept 60 min. at 745-780C, poured, 1.4% Li and 0.15% Cd added in mold, liquid flux 46% LiCl plus 54% KCl, mixed, settled at 750-770C, dip rate 15-18 mm/min), then homogenized for 24 hrs. at 510 $\pm$ 10C. The ingots were then hot pressed into PR306-7 sections (deformation 94%, 420-440C; hardened 60 min. at 525 $\pm$ 5C, aged 12 hrs. at 170C), panels (wall thickness 4-15 mm;

Card   1/32

ACCESSION NR: AT4037660   S/2981/64/000/003/0194/0200

AUTHOR: Fridlyander, I. N.; Romanova, O. A.; Archakova, Z. N.; Gur'yev, I. I.;
Dronova, N. P.; Petrova, A. A.; By*chkova, Z. S.

TITLE: Preparation and testing of intermediate shapes from high-strength heat
resistant aluminum alloy VAD23

SOURCE: Alyuminiyevy*ye splavy*, no. 3, 1964. Deformiruyemy*ye splavy* (Malleable
alloys), 194-200

TOPIC TAGS: aluminum alloy, alloy VAD23, heat resistant aluminum alloy, high strength
aluminum alloy, alloy mechanical property, hot pressed rod, hot pressed section, hot
pressed strip, hot rolled sheet, cold rolled sheet, forged piece, double pressing

ABSTRACT: Immersion-cast ingots (diameter 260 mm) of alloy VAD23 (5.1-5.7% Cu, 1.2-
1.4% Li, 0.096-0.11% Cd, 0.60-0.7% Mn, 0.15-0.25% Ti) were hot pressed (430-450C)
into rods (intermediate diameter 127 mm or final diameter 20 mm), sections PR306-7,
strips with 25x210 mm cross section and pressed panels. The pieces were water quenched
from 525±5C, then aged 16 hours at 170C. Sheets 1.0, 1.5 and 2.0 mm thick were hot

Card 1/2

ACCESSION NR: AT4037660

rolled from strips to 6.0-5.5 mm, then cold rolled to desired thickness with intermediate annealing and finally heat treated (water quenched from $523\pm5C$, aged 16 hours at $170\pm5C$). Forgings (90 or 120x200x400 mm) were forged on a vertical press (deformation 65%, pre-heating 3 hours to 420-440C) from rods (diameter 180 mm) and heat treated as for sheets. Pressed shapes exhibited high tensile strength (66-70 kg/mm^2) at a relative elongation of 3-4%. It was noted that double pressing (i.e., into intermediate diameter rods, then final shape) reduced the tensile strength and increased the plasticity. Mechanical properties of sheets and forgings were lower than those of the pressed shapes. "K. N. Fomin, N. S. Lebedeva, P. G. Reznik, N. Averkina, L. S. Zheltovskaya, Yu. A. Vorob'yev and N. N. Tyurin also took part in the work." Orig. art. has: 7 tables.

ASSOCIATION: none

SUBMITTED: 00   DATE ACQ: 04Jun64   ENCL: 00

SUB CODE: MM   NO REF SOV: 000   OTHER: 000

Card 2/2

L 40951-66   EWT(m)/EWP(k)/T/EWP(w)/EWP(t)/ETI   IJP(c)   JH/JD/HW

ACC NR: AT6024907   (A)   SOURCE CODE: UR/2981/66/000/004/0005/0014

AUTHOR: Fridlyander, I. N. (Doctor of technical sciences); Romanova, O. A.;
Archakova, Z. N.

ORG: none

TITLE: Properties of VAD23 alloy

SOURCE: Alyuminiyevyye splavy, no. 4, 1966, Zharoprochnyye i vysokoprochnyye splavy
(Heat-resistant and high-strength alloys), 5-14

TOPIC TAGS: aluminum alloy, copper containing alloy, lithium containing alloy,
cadmium containing alloy, manganese containing alloy, titanium containing alloy,
alloy composition, metal property/VAD23 aluminum alloy

ABSTRACT: The effects of copper, lithium, cadmium, manganese, titanium, iron, and
silicon on the properties of VAD23 aluminum alloy have been studied under laboratory
conditions. Ingots 70 mm in diameter, cast in a water-cooled mold, were extruded into
round bars 10 mm in diameter, which were machined into the test specimens. In one
series of ingots lithium content varied from 0 to 3.0% at copper contents of 4.0%,
5.0%, and 6.0%, and constant cadmium (0.15%), manganese (0.6%), and titanium (0.15%)
content. In the other series of ingots at a constant lithium (1.3%) and copper
(5.2%) content , the manganese content was varied from 0 to 2.0%, cadmium from
0 to 5.0%, titanium from 0 to 0.3%, and iron and silicon from 0 to 0.9%. It was

Card 1/2

L 40951-66

ACC NR: AT6024907   2

found that: lithium intensifies the effects of aging; copper at contents of 4%—5%,
increases strength; manganese at contents up to 1.0% improves strength and ductility;
up to 0.2% cadmium increases strength of aged alloys and intensifies the effects
of artificial aging; and titanium at contents of up to 0.3% has no effect on tensile
strength but improves rupture strength. Iron and silicon were found to be harmful
impurities. On the basis of these results the optimum composition of VAD23 alloy was
established as follows: 4.9—5.8% copper: 1.0—1.4% lithium, 0.1—0.25% cadmium:
0.4—0.8% manganese; a maximum of 0.3% each of iron and silicon: and a maximum of
0.15% titanium.   Artificial aging at 150—160C for 10—12 hr produces the best com-
bination of mechanical properties: tensile strength, 51—54 kg/mm^2; yield strength,
36—44 kg/mm^2 with an elongation 10—15%. Cold rolling prior to heat treatment, with
reductions from 4% to 10%, promotes intensive grain growth and lowers strength and
ductility. At the present, round and flat ingots are produced by continuous casting
and processed by rolling and extrusion. /Orig. art. has: 10 figures.   [TD]

SUB CODE: 11/ SUBM DATE: none/ ORIG REF: 007/ OTH REF: 006/ ATD PRESS:5056

Card 2/2   hs

L 46984-66   EWT(m)/EWP(t)/ETI   IJP(c)   JH/JD

ACC NR: AT6024912   (A, N)   SOURCE CODE: UR/2981/66/000/004/0037/0048

AUTHOR: Mikhaylov, K. N.; Kovrizhnykh, V. G.; Archakova, Z. N.; Baranchikov, V. M.;
Sandler, V. S.; Shvets, V. A.

ORG: none

TITLE: Preparation of pressed semifinished products from VAD23 alloy

SOURCE: Alyuminiyevyye splavy, no. 4, 1966. Zharoprochnyye i vysokoprochnyye splavy
(Heat resistant and high-strength alloys), 37-48

TOPIC TAGS: aluminum alloy, metal pressing, solid mechanical property / VAD23 alumi-
num alloy

ABSTRACT: In order to determine the possible applications of VAD23 alloy, the influ-
ence of various technological factors on its mechanical properties and structure was
investigated. The optimum mechanical properties were found to be produced by pressing
directly from an ingot which had first undergone homogenization. The optimum pressing
temperature of sections with a flange thickness of 5 mm, 470-490°C, i. e., the temper-
ature to which the blanks are heated, insures high strength characteristics and a com-
paratively good plasticity over the entire length of the section. The elongation per
unit length of the sections is practically independent of the pressing temperature of
the alloy and of the degree of primary recrystallization. A change in the pressing
rate in the range of 0.5-5.0 m/min at pressing temperatures of 250-430°C does not af-

Card 1/2

ACC NR: AT6024912

fect the plasticity of VAD23 alloy, and increases the strength characteristics slight-
ly. In order to slow down the recrystallization of the structure during heating for
quenching of thin sections pressed at 470-490 °C, it is necessary to prepare them with
an elongation coefficient of no more than 25-30. Orig. art. has: 11 figures and 5
tables.

SUB CODE: 11/ SUBM DATE: none

Card 2/2

L 46985-66   EWT(m)/EWP(t)/ETI   IJP(c)   JD/JT

ACC NR: AT6024913   (A , N)   SOURCE CODE: UR/2981/66/000/004/0049/0055

AUTHOR: Romanova, O. A.; Archakova, Z. N.; Vasil'yeva, N. I.   3 2
                                                                     B+1

ORG: none

TITLE: Study of pressed sections and panels of D20 alloy

SOURCE: Alyuminiyevyye splavy, no. 4, 1966. Zharoprochnyye i vysokoprochnyye splavy (Heat resistant and high-strength alloys), 49-56

TOPIC TAGS: metal pressing, aluminum alloy, copper alloy, manganese containing alloy / D20 aluminum alloy

ABSTRACT: The effect of technological factors (elongation during pressing, pressing temperature, homogenization of initial ingot, heat treatment conditions) on the structure and mechanical properties of pressed sections of D20 alloy (of the Al-Cu-Mn system) 2 and 5 mm thick was studied. In order to obtain the optimum mechanical properties, the heat treatment of the sections should consist of quenching after heating at 535° ± 5° C and artificial aging at 160-170°C for 16 hr. This schedule does not cause any tendency in the alloy to corrode under stress. Different elongations (from 14 to 43.4), pressing temperatures (320, 370, 420, and 480°C), and homogenization of the initial ingot do not appreciably affect the structure of the initial ingot or the mechanical properties of sections with wall thicknesses of 2 and 5 mm. Stretching of the sections after quenching raises the yield point substantially, but the tensile strength

Card   1/2