Zr-Ru, Rh, Pd, Os,
Ir, Pt

$Zr_2Pd(Tm,$ VII 2313 1959

$ZrPd(Tm)$

Anderko K.

Z.Metallkunde,1959,50, N12,681-86.

Konstitution von Zirkonium-Palladium-Legierungen.

RX.,1960,64523 Be есть ф.к.

1960

А-916

Zr : с Be, B, Cr, Co, Cu, Ga;
Ge, Au, Fe, Pb, Mn, Hg, Mo, Ni, P,
Pt, Re, Ru, Se, Si, Ag, Ta, Sn, U, V, W,
Zn (Tm)

Диаграммы (фазовое)

1960, 8, N9, 241.

71 soedinenii Zr Tm и кристалл. структуры.

Таблица интерметал. соединений Zr

РЖ., 1961, 7 88 Be

нет в б-ке

Вр - 3005 - VII 1962

Zr_2Pd

Zr_2Pd Stolz Erich

$Zr_{343}Pd_{57}$ Schubert Konrad.

$ZrPd_2$ „Z. Metallkunde"
1962, 53, № 7, 433-44.

Кристр.

Т±2

VII 3578 1963

Zr Rh
3 (T_{tr})

Raub Ch. J., Andersen C.A.,
Z. Phys., 1963, 175, N 1, 105-114
" Über Supraleitfähigkeit von Ti-and
Zr-Rh-Legierungen ".

PM, 1964, 1Ü224 Б, А1

Zr | Ru | Bp - 2087 - VII . 1963.

Raub E;
Roschel E.

(Tm)

„Z. Metallkunde"
1963, 54 (8), 455-63.

VII 3890

Zr_5Ir_3, Hf_5Ir_3, Zr_5Pt_3 крист. стр-ра

Biswas, Kripasch, Schubert

1964

Z. Metall Kunde 1964, 58, N8, 558, Einige neue Phasen vom Mn_5Si_3-Typ.

PM 1968

Mn

VII 3576 1967

$ZrPt_3$, $ZrIr_{3-x}$, $HfPt_3$ (ΔHf)

Brewer L.

Acta metallurg., 1967, N 3, 553

" A most striking confiermation of the Engel metallic correlation ".

Pm, 1067, 8U4 M, Al

VII 4543

1967

Si(Ge)XZ, X = Zr, Hf, Nb, Ta

Z = Pd, Pt, Ni, Co, Fe, Cu

(a, b, c)

Gangberger E., Nowotny H.,
Benesovsky F.,
Monatsh. Chem., 1967, 98, N1, 95-99

Ml

нет ф.к

VII 4481

1967

Zr_4Ru_2N, Zr_4Rh_2N, Zr_4Pd_2N и др.
(a, b, c)

Hollecк H., Thümmler F.,

Monatsh. Chem., 1967, 98, N1, 133-134

Мл

VII 4481

1967

Zr_4Rh_2N, $ZrRu_2N$ и др.

(кр. сир.)

Holleck H., Thümmler F.,

Monatsh. Chem., 1967, 98, N1, 133-134

Мы

VII 4481

1967

Zr_4Pd_2N, Zr_4Ru_2N, Zr_4Rh_2N и др.

(a, b, c)

Holleck H., Thümmler F.,

Monatsh. Chem., 1967, 98, N1, 133-134

Mu

VII 4481 1967

Zr_4Os_2C, Zr_3Fe_3C, Nb_4Co_2C 4 gr.
(a, b, c)

Holleck H., Thümmler F.,
Monatsh. Chem., 1967, 98, N1, 133-134

Ms

ZrRu, ZrRh, ZrPd

ВФ-VII 3577 1967

(кристал. стр-ра, T_{tr})

Wang F.E.,
J.Appl.Phys., 1967, 38, №2, 822-4

" Eguiatomic binary compounds of Zr with transition elements Ru, Rh and Pd."

PM, 1967, 9U32

Б, A1, M1

Zr – платиновые мет-лы.

ΔF°f

2/II–1488

95666z Thermodynamic stability of certain intermetallic compounds made from transition elements. Wengert, Paul R. (Lawrence Radiat. Lab., Univ. of California, Berkeley, Calif.). *U.S. At. Energy Comm.* 1969, UCRL-18727, 118 pp. (Eng). Avail. Dep.; CFSTI. From *Nucl. Sci. Abstr.* 1969, 23(15), 30050. The Zr compounds of Re, Ru, Os, Rh, Ir, Pd, Pt, Ag, and Au were studied. Limits and est. of the Gibbs free energy of formation of these compds. are detd. by observing high temp. reactions of C and ZrC with the above elements and with their Zr compounds. $ZrRh_3$, $ZrIr_3$, $ZrPd_3$, and $ZrPt_3$ exist in equil. with C and ZrC and have $\Delta F° < -11.5$ kcal./g.-atom of compd. calcd. at 298°K. C and ZrC exist in equil. with the Ru (0.75 at. % Zr), Os ($\leq$0.06 at. % Zr), Ag (liq., $\leq$0.05 at. % Zr), and Au (liq., 9.5 ± 3.5 at. % Zr) phases at 1500°C. The $\Delta F_f°$ ($ZrRu_2$) is calcd. from the equil. data to be -13.6 ± 0.9 kcal./g.-atom at 1500°C. and $\Delta F_f°$ ($ZrAu_4$) is calcd. to be -7.93 ± 0.35 kcal./

(+9)

C. A. 1969. 71. 20

1969

g.-atom at 1000°C. The activity coeffs. of Zr (γ_{Zr}) in the limit of 0% Zr are calcd. from the 3-phase equil. No ternary compds. were observed for the above systems. In the case of the C–Zr–Re system, a molar ratio of Zr to Re of 19.0 to 81.0 was found in the hexagonal close packed Re phase in the presence of C and ZrC, indicating that this phase extended into the ternary system; therefore, no thermodynamic information could be determined by this method for the Zr–Re binary system. The lattice parameters of the expanded hexagonal close packed Re phase are: a = 2.7810 ± 0.0004, c = 4.4590 ± 0.0008 A. Miscellaneous properties of the binary alloys are given. Reactions of carbides, borides, and nitrides with transition elements reported by other authors are reviewed. Limits on $\Delta F_f°$ of the following compds. are calcd. at 298°K.: $ZrRh_3$, $ZrIR_3$, $HfRh_3$, $HfIr_3$, $ThIr_2$, $ThRh_2$, $ThAu_3$, $NbPt_3$, $NbIr_3$, $NbRe_{3\pm x}$, $TaPt_3$, UIr_3, URh_3, U_2IrC_2, U_2RhC_2, and UAu_3. The Engel and Brewer concepts of crystal structure and bonding are included. TCNG

$ZrRh_3$; $ZrIr_3$; $ZrPd_3$; $ZrPt_3$; $ZrRu_3$; $ZrAu_3$; $HfRh_3$; $HfIr_3$; $ThIr_2$; $ThRh_2$; URh_3; $NbPt_3$; $NbIr_3$; $NbOs_2$; $TaPt_3$; UIr_3; URh_3; UPt_3; UAu_3 (ΔG°) (Ru

Wengert P.R. VII 4680.

U.S. At Energy Comm. 1969, UCRL-18787, 10

Thermodynamic stability of certain intermetallic compounds made from transition elements.

M ⓟ 24

CA, 1969, 71, N20, 95666z

$CoZrF_6 \cdot 6H_2O$.

1970

Ghosh B.;
et al.

(Ср; магнит.)

" Proc. Nucl. Phys. Solid State Phys. Symp. 15th 1970, (Pub 1971), 3, 615-21.

(см. $CoF_2 \cdot 5HF \cdot 6H_2O$; I)

$PdPr_3$, $PdTh_3$, $PdGd_3$, $PdTb_3$, Pd_2U_3, Pd_2Lu_3,
$PdSi_3$, $PdSc_3$, $PdZr_3$, $PdHf_3$, $PdTi_3$. 1970

867 VII 5864 Кристаллография

Harris I.R., Norman M.
"J. Less-Common Metals", 1970, 22, №1,
127-130 (англ).

Изменение периодов решеток некоторых твердых растворов d-Pd-X и соединений Pd_3X.

Ж. Мл 20

РЖ., 1971, 1И38

Zr RuGe, NdFeGe; HfFeGe, TiIn Si 1970

Jeitschko Wolfgang. 7 VII 5874 Кристаллография

„Met. Trans.": 1970, 1, №10, 2963-2965 (англ.)

Тройные фазы со структурой Ti Fe Si и упорядочением по типу Fe_2P."

Ю

Ли.

Ри, 1971, 4Ц64.

+ VII 3615 1970

Zr_2Ni_2Sn, $ZrCo_2Sn$, $HfCo_2Sn$, $NbCo_2Sn$, $HfNi_2Sn$, $NbNi_2Sn$, $TiCo_2Sn$, $TiNi_2Sn$, $ZrNiSn$, $NbCoSn$, $NbRhSn$, $TiNiSn$, $HfNiSn$, $ZrPdSn$: Струк. ф-ра.

Jeitschko W. „Met. Trans" 1970, 1, № 11, 3159-3162 (англ.).

Сплавы переходных металлов со структурой типа $MgAgAs$ и $LiCu_2N$.

Mil 20

РЖ, 1971, 5И52

VII-6201

1971

$ZrPt_3$

(ΔHv ; ΔHf ΔGf.)

9I891d Thermodynamics of $ZrPt_3$ (zirconium-platinum intermetallic). Carbonara, Robert S.; Blue, Gary D. (Battelle Mem. Inst., Columbus, Ohio). *High Temp. Sci.* 1971, 3(3), 225–30 (Eng). The high temp: mass spectrometric technique has been applied to the detn. of activities of components in reaction systems contg. Pt and $ZrPt_3$ during studies directed toward quant. confirmation of the Brewer-Engel theory and its prediction of some extremely stable intermetallic compds. formed by certain transition metals. $ZrPt_3$ in a beryllia Knudsen cell was studied at 1800–2600°K. Pt(g) was readily observable, but Zr activity values were detd. from ZrO(g), Be(g), and known properties of BeO(s). Activities and partial molar heats of vaporization of the component metals give free energy and heat of formation values in accord with Brewer's predictions and lend support to vital aspects of the theory.

C.A. 1971. 75 IV

$CoZrH_6 \cdot 6H_2O$

1971

T2

132200n Magnetic study of a reversible phase transition in $CoZrF_6.6H_2O$, $Co_{1-x}Zn_xSiF_6.6H_2O$, and $Co_{1-x}Zn_xF_25HF.6H_2O$. Dutta-Roy, S. K.; Ghosh, B.; Kar, Supratik (Dep. Phys., Indian Inst. Technol., Kharagpur, India). *J. Phys. Chem. Solids* 1971, 32(4), 857–65 (Eng). Magnetic anisotropy of $CoZrF_6.6H_2O$, $Co_{1-x}Zn_xSiF_6.6H_2O$, and $Co_{1-x}Zn_xF_2.5HF.6H_2O$ was examd. at 90–300°K. These salts showed phase transition characteristics. The transition temp. $T_c \sim 246 \pm 2$°K in $CoZrF_6.6H_2O$ is comparable to that obsd. in $CoSiF_6.6H_2O$ and $CoF_2.5HF.6H_2O$. In $Co_{1-x}Zn_xSiF_6.6H_2O$ and $Co_{1-x}Zn_xF_2.5HF.6H_2O$ the transition temp. T_c moves toward low temp. as the Zn concn. x in the crystal increases, and the crit. concn. x_c at which phase transition disappears depends on the nature of the parent lattice. The interpretation shows that the low-temp. magnetic anisotropy data of concd. salt are consistent with a structural model which assumes that there are 2 inequiv. sites of Co^{2+} in the unit cell. Furthermore, the diln. expt. resolved the apparent discrepancy between the low-temp. x-ray and ESR data of $CoSiF_6.6H_2O$. RCKH

C.A. 1971. 74. 24

(H)

$Zr_{11}Os_4$ 7 VII 5890 Крист. стр-ра 1971

Mc Carthy S. L, Schmidt L. A.

„J. Less-Common Metals" 1971, 23, № 2, 241-243 (англ)

Новое соединение в сплавах системы цирконий - осмий.

○ АЕ Мл

РЖ, 1971, 6И40.

1971

$ZrFe_2$

$ZrCo_2$

$TiCo_2$

$TiFe_2$

(T_m)

(28275m) Polythermal sections of $ZrFe_2$-$TiFe_2$ and $ZrCo_2$-$TiCo_2$ systems. Pet'kov, V. V.; Kocherzhins'kii, Yu. O.; Markiv, V. Ya. (Inst. Metalofiz., Kiev, USSR). *Dopov. Akad. Nauk Ukr. RSR, Ser. A* 1971, 33(10), 942–4 (Ukrain). The phase diagrams for the pseudobinary systems $ZrFe_2$-$TiFe_2$ and $ZrCo_2$-$TiCo_2$ were plotted on the basis DTA, x-ray, and microstructural anal. data for Zr-Ti-Fe and Zr-Ti-Co alloys after annealing in vacuum at 900° for 200 hr and quenching in water. $ZrFe_2$, $ZrCo_2$, and $TiCo_2$ melt at 1640 ± 10, 1565 ± 10, and 1235 ± 10°, resp. $TiFe_2$, 1435 ± 10°, has a homogeneous region in the range 32–5 atom % Ti. At 900° $ZrFe_2$ and $TiFe_2$ dissolves 8 atom % Ti and 16 atom % of Zr, resp. Interactions in $ZrCo_2$–$TiCo_2$ system result in the formation of a continuous series of solns. Frantisek Cejnar

Системы из металлов

C. A. 1972. 76. 6

ZrOs

$ZrOs_2$

Tm

1972

117917q Phase diagram of the zirconium–osmium system in the 50–100 at. % osmium region. Eremenko, V. N.; Shtepa, T. D.; Semenova, E. L. (Inst. Probl. Materialoznavstva, Kiev, USSR). *Dopov. Akad. Nauk Ukr. RSR, Ser. B* 1972, 34(1), 50–2 (Ukrain). By x-ray and microstructural analyses of the system Zr–Os, contg. 50–100 at.% Os, the existence of the eutectic compds. $ZrOs_2$ with lattice parameters *a* 5.20 and *c* = 8.53 Å and ZrOs of the CsCl-type structure (*a* = 3.26 Å) is disclosed. $ZrOs_2$ melting congruently at 2660° has a tapering region of homogeneity between 62.5–67 at. % Os at 2300° and 66.67 at. % Os at 1700°. ZrOs melts incongruently at 2040°. $ZrOs_2$ forms with Os solid solns. with m.p. 2440°. A complete phase dia. of the Zr–Os system is given. Frantisek Cejnar

C.A. 1972. 76. 20

$ZrFe_2$

1972

117327p Nuclear γ-resonance study of the effect of hydrogen on the electronic structure of iron atoms in the Laves phase of $ZrFe_2$. Rudnev, I. I.; Bykov, V. N.; Shcherbak, V. I. (Fiz. Energ. Inst., Moscow, USSR). *Fiz. Metal. Metalloved.* 1972, 34(4), 856–8 (Russ). The Moessbauer effect of ^{57}Fe in $ZrFe_2$ and $ZrFe_2H_{0.3}$ was studied. The Laves $ZrFe_2$-phase had a cubic lattice of the $MgCu_2$ type and behaved as a ferromagnetic whose Curie point, T_c, was ~630°K. The neutron-diffraction anal. of $ZrFe_2H_{0.3}$ showed that H was localized in tetrahedral voids and was surrounded by 3 atoms of Fe and 1 atom of Zr. The Moessbauer spectra were composed of 6 absorption peaks. The distances between these max. were practically independent of the H concn. The effective magnetic field in $ZrFe_2$ was 198 kOe in agreement with published data, whereas, in the case of $ZrFe_2H_{0.3}$ it was ~201 kOe. The absence of important changes in H_{eff} after hydrogenation indicated the concn. stability of conduction electrons and the const. d. of *d*-electrons. The isomer shifts were −0.18 and −0.19 mm/sec for $ZrFe_2$ and $ZrFe_2H_{0.3}$, resp. The isomer shift stability confirmed the absence of electronic-structure changes on introducing H into the $ZrFe_2$ lattice. This H either occupied the 4*d*- and 5*s*-orbitals of Zr or preserved its charge close to zero. D. Jovanovic

(Tcurie)

C.A. 1973.

78 n 18

ZrPt$_3$

P.J. Meschter
W.L. Worrell

1973
1350

(ΔG_f°)

"Симпозиум по физ-хим. технике высоких темп. 1000–4000°К. 3-7 сент. 1973, Вена, Австрия"

"A High-Temp. Thermodyn. Investig.

гаетбVI, стр 59–66.

1974

Zr_2Pd

$ZrPd$

(Tm)

129918c Physicochemical study of the zirconium-palladium (ZrPd)/zirconium/zirconium-silver (ZrAg) partial phase diagram. Loboda, T. P.; Raevskaya, M. V.; Kovaikina, V. K.; Sokolova, I. G.; Pyatnitskii, V. N.; Sokolovskaya, E. M. (USSR). *Strukt. Faz, Fazovye Prevrashch. Diagr. Sostoyaniya Met. Sist.* 1974, 147–9 (Russ). Edited by Ivanov, O. S.; Alekseeya, Z. M. "Nauka": Moscow, USSR. Interactions in the ternary Zr–Pd–Ag system and in the binary subsystems were studied exptl. The alloys studied (overall 28 compns.) were prepd. in an arc furnace in a purified He atm. and analyzed as cast or annealed specimens (at 550–750° for 12 hr, at 350–500° for 24 hr, and at 200–300° for 48 hr). The partial phase diagram of annealed alloys of the ZrPd–Zr–ZrAg system was constructed. Two intermetallic compds. Zr_2Pd (m. 1085°, of tetragonal $MoSi_2$ type) and ZrPd (m. 1600°, of cubic CsCl type) are formed by interaction of Zr with Pd. Zr forms 2 compds. with Ag by peritectic reactions, $AgZr_2$ at 1170° and AgZr at 1135°. ZrPd and ZrAg interact with each other and form a region of 2-phase equil. so that the section studied is quasibinary in the solid phase. The compds. Zr_2Ag and Zr_2Pd form a continuous series of solid solns.

J. J. Linek

C. A. 1975. 82. 11120 (+1) $AgZr_2$, AgZr (X)

Zr_2Rh

1974

Zr_2Ir, Zr_2Co, Zr_2Ni.

(Ttr)

132293a Relation between normal state properties and T_c for some Zr_2X compounds. Fisk, Z.; Viswanathan, R.; Webb, G. W. (Inst Pure Appl. Phys. Sci., Univ. California, La Jolla, Calif.). *Solid State Commun.* 1974, 15(11–12), 1797–9 (Eng). The region of the neg. curvature of the normal state resistivity curve of the isoelectronic compds. Zr_2X (X = Rh, Ir, Co, and Ni) shifts to higher temps. as the superconducting transition temp. decreases.

C.A. 1975. 82. N20

Pt x Zr

1974

фазов. диаграмма

129923a Phase diagram of the platinum-zirconium system. Savitskii, E. M.; Polyakova, V. P.; Voronova, L. I. (USSR). *Strukt. Faz, Fazovye Prevrashch. Diagr. Sostoyaniya Met. Sist.* 1974, 164-6 (Russ). Edited by Ivanov, O. S.; Alekseeva, Z. M. "Nauka": Moscow, USSR. The interactions of Pt with Zr were studied at ≤50 at.% Zr by measuring m.ps., hardness, and microhardness and by microstructural and x-ray phase anal. A wide region of solid solns. based on Pt and only 2 known chem. compds., Pt_3Zr and PtZr, were found. A peritectic point occurs at 1780 ± 10°, and a eutectic point, between Pt_3Zr and PtZr at 1855 ± 25° and 45 at.% Zr. The max. soly. of Zr in Pt is ~11 at.%; the alloys with 6 at.% Zr are malleable.

J. J. Linek

C. A. 1975 82. N 20

$ZrPt_3$

$HfPt_3$

1974

67559e Measurement of the enthalpies of formation of zirconium-platinum ($ZrPt_3$) and hafnium-platinum ($HfPt_3$) by fluorine bomb calorimetry. Srikrishnan, V.; Ficalora, P. J. (Dep. Chem. Eng. Mater. Sci., Syracuse Univ., Syracuse, N. Y.). *Met. Trans.* 1974, 5(6), 1471–5 (Eng). The enthalpies of formation of $ZrPt_3$ and $HfPt_3$ were detd. by F-combustion calorimetry. The results, -30.8 ± 2.0 and -33.0 ± 2.5 kcal/g-atom, resp., support the predictions of the Engel-Brewer correlation of metals and alloys. The unusually large heats of formation are considered to be caused by a transfer of *d* electrons in a typical Lewis acid–base reaction. N. L. Shepard

(ΔH_f)

C.A. 1974. 81. N12

(41)

$ZrPt_3$

1975

Aleschter P.J., et al

4ème Conf. int. thermo chim., Montpellier, 1975, Vol 3, S. 1, S. a. 233-40.

(ΔG_f / ΔH_f)

(cal $TiPt_3$; I)

1975

Zr-Ir

(Ttr)

C. A. 1975
83 n 18

156571m Superconductivity in the zirconium-iridium system. Moiseev, D. P.; Semenova, E. L.; Uvarova, S. K. (Inst. Fiz., Kiev, USSR). *Fiz. Met. Metalloved.* 1975, 39(6), 1163-7 (Russ). The supercond. was examd. of as-cast, as-quenched, and annealed Zr-Ir alloys contg. 10, 20, 25, 30, 33.3, 37.5, 50, 66.6, and 75 at. % Ir at 1.85-8.0°K. No supercond. phenomena could be detected for $ZrIr_3$ down to 1.85°K, whereas the temp. of the supercond. transition T_s of $ZrIr_2$ was ~4.03°K, in agreement with the value found by B.T. Matthias et al. (1961). For ZrIr T_s ~ 2.1°K; upon annealing at 1400 and 1700° the alloy lost its supercond., which was restored by quenching from 1400°. Hence the supercond. of ZrIr may be conditioned by the existence of a high-temp. modification. Zr_2Ir was characterized by 2 transition temps. (T_s ~ 2.75 and 7.35°K); after annealing only the 2nd transition was preserved. A similar behavior was obsd. for Zr-20 at. % Ir and Zr-25 at. % Ir. As-cast Zr-10 at. % Ir had only 1 superconductive transition (T_s ~ 5.5°K), but the general shape of the transition curve was subsequently changed on annealing at 1000°. The peculiarities found are explained in terms of phase transitions occurring over the 700-1000° range. The nature of these transitions could not be established because of the nonexistence of the Zr-Ir state

ZrOs (Tm)

1976

$Zr_{11}Os_4$

ZrOs x

prezb.

guarn.

) 85: 167363n Phase diagram of the zirconium-osmium system. Eremenko, V. N.; Semenova, E. L.; Shtepa, T. D. (Inst. Probl. Materialoznavstva, Kiev, USSR). *Dopov. Akad. Nauk Ukr. RSR, Ser. A: Fiz.-Mat. Tech. Nauki* 1976, (7), 661-5 (Ukrain). The binary Zr-Os system was studied at 0-50 at. % Os by metallog., x-ray, and DTA methods. Intermediate phases ZrOs and $Zr_{11}Os_4$ melt incongruently at 2040 and 1350°. The soly. of Os in β-Zr at the eutectic temp. 1270° is ~14 at. % and in α-Zr <1 at. % at 500°. The phase diagram of the Zr-Os system is given over the whole concn. range. Z. Pacl

C.A. 1976 85 n22

ZrPt5
ZrPt3
HfPt3
(ΔGf)

1977

87: 12440c **An investigation of high temperature thermodynamic properties in the platinum-zirconium and platinum-hafnium systems.** Meschter, P. J.; Worrell, W. L. (Dep. Metall. Mater. Sci., Univ. Pennsylvania, Philadelphia, Pa.). *Metall. Trans., A* 1977, 8A(3), 503-9 (Eng). High-temp. thermodn. properties of Pt-Zr alloys contg. 2 to 25 at. % Zr and Pt-Hf alloys contg. 20 to 25 at. % Hf were measured from 1100 to 1400 K by a galvanic cell technique using a thoria-based electrolyte. Activities of Zr and Hf show large neg. deviations from Raoult's law; at 1300 K and 23 at. % Zr or Hf, for instance, $a_{Zr} = 6.5 \times 10^{-16}$ and $a_{Hf} = 7.0 \times 10^{-17}$. Correlation of emf. results with x-ray phase data enables calcn. of std. free energies of formation of the intermediate compds. $ZrPt_5$, $ZrPt_3$, and $HfPt_3$. At 1300 K $\Delta G_f^0(ZrPt_5) = -92{,}680$; $\Delta G_f^0(ZrPt_3) = -91{,}740$; and $\Delta G_f^0(HfPt_3) = -97{,}350$ cal/mol. The high stabilities of

(+1) [X]

C.A. 1977 87 N2

phases in the Pt–Ti, Pt–Zr, and Pt–Hf systems verify the predictions of the Engel–Brewer correlation. The large neg. entropies of formation of $TiPt_3$, $ZrPt_3$, and $HfPt_3$ are discussed. Applications including side reactions in fuel cells and thermocouple systems are mentioned.

Zr Ir

Zr Ir_3

1980

Tm; Ttz

93: 192970f Zirconium–iridium phase diagram. Eremenko, V. N.; Semenova, E. L.; Shtepa, T. D. (Kiev, USSR). *Izv. Akad. Nauk SSSR, Met.* 1980, (5), 237–41 (Russ). The Ir–Zr phase diagram at 600–2400°, was constructed from metallog., thermal anal., and x-ray phase anal. data. Solidus temps. were detd. by the Pirani–Alterthum method. The system contains solid solns. and intermediate phases based on Zr_3Ir, Zr_2Ir, Zr_5Ir_3, ZrIr, $ZrIr_2$, and $ZrIr_3$. The phases ZrIr and $ZrIr_3$ congruently m. at 2050 and 2280°, resp. The other phases form by peritectic reaction at 1305, 1340, 1730, and 2085°, resp. A polymorphic transition of ZrIr occurs at 920–950°. A eutectoid transition of β-Zr based solid solns. occurs at 775°.

C. A. 1980, 93 N 20

$Zr_x Pt_y$

сплав

1980

94: 91376g **High-temperature thermodynamic activities of zirconium in platinum alloys determined by nitrogen-nitride equilibriums.** Goodman, D. A. (Lawrence Berkeley Lab., Univ. California, Berkeley, CA USA). *Report* 1980, LBL-10633, 82 pp. (Eng). Avail. INIS; NTIS. From *INIS Atomindex* 1980, 11(21), Abstr. No. 557957. A high-temp. N_2–nitride equil. app was constructed for the study of Zr–Pt alloy thermodn. to 2300°. Careful attention was paid to the problems of diffusion-limited reaction and ternary-phase formation. The activity of Zr and the free energy of formation of Zr_9Pt_{11} were detd. at 1985°. These results are in accord with the VB theory of Engle and Brewer, and confirm their prediction of an unusual interaction in these alloys.

т. дип.

сб-ва

C.A. 1981 94, N 12

Zr-Pt

(cnab)

1980

94: 2127Sc High-temperature thermodynamic activities of zirconium in platinum alloys determined by nitrogen-nitride equilibrium. Goodman, D. A. (Lawrence Berkeley Lab., Univ. California, Berkeley, CA USA). *Report* 1980, LBL-10633, 82 pp. (Eng). Avail. NTIS. From *Energy Res. Abstr.* 1980, 5(19), Abstr. No. 30889. A high-temp. nitrogen-nitride equil. app. was constructed for the study of alloy thermodn. to 2300°. The Zr–Pt alloys were studied by means of the reaction $9ZrN + 11Pt \rightarrow Zr_9Pt_{11} + 9/2\ N_2$. Careful attention was paid to the problems of diffusion-limited reaction and ternary phase formation. The activity and free energy values were detd. at 1985° as 2.4×10^{-4} and −16.6 kcal/g-atom., resp. These results are in agreement with the valence bond theory developed by Engel and Brewer; this confirm their prediction of an unusual interaction of these alloys.

ΔF

C.A. 1981. 94 N 4

Zr_2Pd

1980

Maeland A. J., et al.

J. Less-Common Metals.

Kp. 044 1980, 74, 12, 295-300

Cell. Zr_2Cu - I

$Pd_{30}Zr_{70}$

1980

V93: 155946g **Ultrasonic absorption in the superconducting amorphous metal palladium zirconium (PdZr).** Weiss, G.; Arnold, W.; Guentherodt, H. J. (Max-Planck-Inst. Festkoerperforsch., D-7000 Stuttgart, 80 Fed. Rep. Ger.). *Phonon Scattering Condens. Matter, [Proc. Int. Conf.], 3rd* 1979 (Pub. 1980), 73-6 (Eng). Edited by Maris, Humphrey J. Plenum: New York, N. Y. The propagation of longitudinal 740-MHz waves in an amorphous $Pd_{30}Zr_{70}$ superconductor was measured at 0.4-70 K. The ultrasonic attenuation shows a shallow max. at ~20 K, followed by a steady decrease, with decreasing temp. down to ~3 K. From this temp., the absorption remains almost const. down to ~1.5 K, and in particular there is no change at the superconducting transition temp. (T_c = 2.62 K). Between 1.5 and 0.4 K, the attenuation decreased markedly. The obsd. attenuation is interpreted on the basis of a relaxational contribution arising from a strain modulation and a subsequent relaxation of energy levels.

(Ttz)

C.A. 1980, 93, N16

Rh Zr3 Commun 1159 1981

96: 169732h An accurate determination of the excess low temperature heat capacity of a superconducting metallic glass. Garocho, P.; Johnson, W. L. (Lab. Phys. Solides, 91405 Orsay, Fr.). *Solid State Commun.* 1981, *39*(3), 403-6 (Eng). The sp. heat of an amorphous superconductor $RhZr_3$ (T_c = 4.3 K) was measured at 0.35–10 K with an applied magnetic field of 75 kG. The high field suppresses supercond. and allows accurate detn. of the phonon (βT^3) term for the lowest temps. studied. Subtraction of the normal electronic sp. heat (γT) and phonon terms reveals a well-defined excess linear heat capacity at low temp. This excess term is attributed to localized lattice excitations by using the 2-level tunneling defect model of Phillips.

Cp

C.A. 1982, 96, N 20

1981

$Pt_{21}Zr_{79}$

95: 68920s Transition metal alloy heats of formation from photoemission data. Oelhafen, P. (Inst. Phys., Univ. Basel, CH-4056 Basel, Switz.). *J. Phys. F* 1981, 11(2), L41-L45 (Eng). A method is described for estg. transition metal alloy heats of formation (ΔH) from valence-band and core-electron binding-energy photoemission data. It is assumed that (*i*) ΔH is detd. by the *d*-band properties of the alloy, (*ii*) the core electrons do not contribute to ΔH, (*iii*) the *d*-band centroid position shifts on alloying may be detd. from UPS valence-band spectra, and (*iv*) the charge transfer on alloying may be neglected. The method is applied to $Pt_{21}Zr_{79}$, $Ag_{20}Sc_{80}$, $Pd_{35}Zr_{65}$, $Rh_{25}Zr_{75}$, $Cu_{60}Zr_{40}$, $Pd_{34}Ti_{66}$, and $Cu_{40}Ti_{60}$ alloys with split *d* bands for which accurate photoemission data are available. The alloy heats of formation, deduced from photoemission data, agree with calcd. and directly measured values of ΔH.

ΔH_f

(+6)

CA 1981, 95, N8

(corr. Pt_2Zr_7)

Ir Zr_2 1982

Kuentzler R.

Cp; Supercond. d-f-Band Met., Proc. Conf., 4th 1982, 447-50.

(cw. $FeZr_2$; I)

PdZr$_2$ 1982.

Kuentzler R.

Cp; Supercond. d-f-Band Met., Proc. Conf., 4th 1982, 447-50.

(cer. FeZr$_2$; I)

$RhZr_2$ 1982

Kurentzler R.

Supercond. d-f-Band

Cp°; Met., Proc. conf., 4th 1982, 447-50.

(Ccr. $FeZr_2$; $\bar{I}$)

$PtZr_2$

1982

Kuentzler R.

Supercond. d-f-Band

Cp; Met., Proc. Conf., 4th

1982, 447-50.

(Ce. $FeZr_2$; I)

Zr75 Rh25

1982

100: 145980n **High temperature heat capacity of zirconium–rhodium ($Zr_{75}Rh_{25}$) superconducting system in amorphous, metastable, and stable crystal state.** Panova, G. Kh.; Chernop'lekov, N. A.; Shikov, A. A.; Fogorassy, B.; Kemen, T.; Cziraki, A. (Inst. At. Energ., Moscow, USSR). *Report* 1982, IAE-3610/10, 9 pp. (Russ). Avail. INIS. From *INIS Atomindex* 1983, 14(24), Abstr. No. 805535. The heat capacity of the $Zr_{75}Rh_{25}$ [51844-72-5] superconducting compd. in amorphous, metastable and stable crystal states at 100–700 K was measured by using a differential scanning calorimeter. The d. of electron states at the Fermi level increases during the process of amorphous state formation, but a phonon spectrum, as a whole, becomes more rigid and an anharmonicity becomes stronger. The crit. transition temp. increase during the process of amorphous state formation is mainly assocd. with the increase of electron d. of states at the Fermi level.

(Cp)

C.A. 1984, 100, N 18

ZrRuP

1982

Stewart G. R., Meis-
ner G. P., Ku H. C.
Supercond. d-f-Band
Cp; Met., Proc. Conf., 4th 1982,
331-5.

(cor. MfRuP; I)

Zr Pt$_x$ 1983

Lasjaunias J. C.,
Ravex A.

Cp; J. Phys. F 1983, 13 (6),
L 101 – L 106.

(Сеч. Zr Hg$_x$ i I)

Zr_2PdH_x

1984

100: 109397u **Diffusion properties and phase transitions of the metallic glass amorphous zirconium palladium hydride (Zr_2PdH_x).** Bowman, R. C., Jr.; Cantrell, J. S.; Attalla, A.; Etter, D. E.; Craft, B. D.; Wagner, J. F.; Johnson, W. L. (Monsanto Res. Corp.-Mound, Miamisburg, OH 45342 USA). *J. Non-Cryst. Solids* 1984, 61-62(1), 649-54 (Eng). NMR measurements were made to deduce H diffusion parameters in a-$Zr_2PdH_{2.9}$. Non-Arrhenius temp. dependence as well as enhanced H mobility was found for a-$Zr_2PdH_{2.9}$ in contrast to the Arrhenius behavior in 2 cryst. $Zr_2PdH_{2.90}$ phases. Differential scanning calorimetry and x-ray diffraction indicate that both the initial *a*-Zr_2Pd alloy and the amorphous hydride undergo irreversible transformations at elevated temps. Although *a*-Zr_2Pd forms the cryst. intermetallic, *a*-$Zr_2PdH_{2.9}$ can generate either cryst. Zr_2PdH_x or ZrH_x as the major decompn. product.

(Ttr)

C.A. 1984, 100, N 14

Zr_3Rh (аморфн.) 1984

11 Е285. Исследование теплопроводности аморфного сплава Zr_3Rh. Пшеничный Б. И., Медведев В. А., Ярунцев В. К. «Метрол. обеспеч. теплофиз. исслед. при низк. температурах». М., 1984, 42—46

Теплопроводность образца аморфного сплава Zr_3Rh в виде ленты толщиной 50 мкм и шириной 2 мм исследовались в интервале т-р 2—20 К. Примененный метод двух нагревателей и двух термометров позволил экспериментально определить тепловые потери по подводящим проводам. Разность т-р измерялась в температурной шкале одного из термометров. Установлено, что при т-рах выше т-ры сверхпроводящего перехода коэф. теплопроводности хорошо описывается степенной ф-цией с показателем степени 0,8. Резюме

теплопровод-

сф. 1984, 18, N 11

Zr_3Rh-H_2

1984

10 Б3025. Теплоемкость некристаллических металлических гидридов при низких температурах. Low temperature specific heat of non-crystalline metallic hydrides. Samwer K., Tebbe J. «J. Less—Common Metals», 1984, 103, № 1: Int. Symp. Prop. and Appl. Metal Hydrides IV, Eilat, Apr. 9—13, 1984, 92 (англ.)

Теплоемкость C_p некрист. гидридов $Zr_3Rh—H_2$ (I) измерена при низких т-рах (не указаны). I получены наводороживанием сплава при $t<200°$, при к-рой диффузия мет. атомов не происходит и образуется некрист. фаза. Из C_p-данных вычислены плотности состояний вблизи уровня Ферми и θ_D. Для $H/M \sim 1{,}5$ θ_D вдвое выше, чем для аморфного Zr_3Rh (II). Плотность состояний I в 4 раза ниже, чем для II. Полученные данные могут быть использованы для оценки параметров перехода металл—изолятор при больших конц-иях H в сплавах. Л. А. Резницкий

Cp;

Х. 1985, 19, №10

Zr3Ir

1985

22 Б2017. Zr_3Ir с тетрагональной структурой типа α-V_3S. Zr_3Ir with tetragonal α-V_3S structure. Cenzual K., Parthé E. «Acta crystallogr.», 1985, C41, № 6, 820—823 (англ.)

Осуществлен синтез и рентгенографич. исследование (R 0,060) Zr_3Ir (I). Установлен СТ α-V_3S, характерный для Ni_3P, Fe_3P, Ti_3P и Hf_3As. Параметры тетрагон. решетки: a 10,788, c 5,662 А, ρ (выч.) 9,39, Z 8, ф. гр. $I\bar{4}2m$. Атомы металлов в структуре располагаются по вершинам тетраэдрич. звезд (тетраэдры с дополнит. атомами над каждой гранью), упакованными колонками, вытянутыми вдоль оси c (Zr—Ir 2,739—3,481, Zr—Zr 2,904—3,598 А). Отмечено, что в случае I СТ α-V_3S впервые реализуется для соединения, состоящего из 2 переходных элементов. С. В. Соболева

параметры решетки

Х. 1985, 19, N 22.

$Pd_{0,35}Zr_{0,65}D_x$ 1985

4 Б3025. Теплоемкость стеклообразных металлических гидридов при низких температурах. Kai K., Suzuki K., Gachneidner K. A. «Нихон киндзоку гаккай кайхе, Bull. Jap. Inst. Metals», 1985, апр., спец. номер, **4**, 150 (яп.; рез. англ.)

Теплоемкость стеклообразных гидридов $Pd_{0,35}Zr_{0,65}D_x$ при $x=0$—0,8 измерена в интервале 1,2—10 К. Из опытных данных вычислен коэф. электронной теплоемкости γ, к-рый линейно уменьшается с увеличением x от 0 до 0,4. Т-ра Дебая $\Theta_D=210$ К при $x=0$ и 320 К при $x=0,4$. При более высоких конц-иях D Θ_D уменьшаются. Численные значения γ не приведены. Исследование выполнено с целью выяснения влияния окружения атомов D на электронную структуру гидридов. Резюме

Cp;

Х. 1986, 19, N 4

Оп. 22871 1985

$Pd_{0,33}Zr_{0,67}Hx$

$Pd_{0,35}Zr_{0,65}Hx$

Muzutani H., Okta S., et al.,

Cp; электро-сопротив.

J. Phys. Soc. Jap., 1985, 54, № 9, 3406 – 3414.

$ZrPd_{3c}$ 1985

Pasteeel A.,
Colinet C., et al.

ΔH_f; Calphad, 1985, 9, N4,
349–362.

(см. Германий Fe; I)

Zr_3RhH_x (Om. 23976) 1985

Wagner J. E., Bowman R. C. Jr., et al.

ΔH_{tr}; J. Appl. Phys. 1985, 58 (12), 4573-81.

(cf. ZrZ_2PdH_x; I)

Zr_2PdHx (Om 23976) 1985

104: 92075v **Differential scanning calorimetry studies of amorphous zirconium palladium hydride (Zr_2PdH_x) and zirconium rhodium hydride (Zr_3RhH_x).** Wagner, J. E.; Bowman, R. C., Jr.; Cantrell, J. S. (Monsanto Res. Corp.-Mound, Miamisburg, OH 45342 USA). *J. Appl. Phys.* 1985, 58(12), 4573-81 (Eng). The effects of H concn. and crystal structure on the thermal stability of amorphous Zr_2PdH_x (a-Zr_2PdH_x) and Zr_3RhH_x samples were studied with DSC. Samples showing endothermic irreversible transitions are a-Zr_2PdH_x [x = 1.91 (powder and foil)/2.7] and a-Zr_3RhH_x (x = 3.7/4.1/5.0/5.1/5.2). Samples showing exothermic irreversible transitions are a-Zr_2Pd alloy, a-$Zr_2PdH_{1.91}$ (powder and foil), a-Zr_3Rh alloy, and a-Zr_3RhH_x (x = 3.7/4.1/5.0/5.1). Powder x-ray diffraction methods suggest that cryst. Zr_2PdH_x, ZrH_x, and ZrPd are decompn. products from the Zr_2PdH_x system, that depend on exptl. conditions. The a-Zr_3RhH_x hydrides decompd. into ZrH_x phases and Rh. The effect of DSC heating on the products, the heats of transition, and the activation energies are presented.

ΔH_f;

⊕ ⊠ Zr_3Rh ● Hx

C.A. 1986, 104, N 12

Zr_2Rh
$ZrRh$ и др

1986

107: 13529g Study of the binary system zirconium-rhodium by differential thermal analysis, levitation thermal analysis, and quantitative calorimetry at very high temperatures. Gachon, J. C.; Charles, J.; Hertz, J.; Jorda, J. L. (Lab. Thermodyn. Metall., Univ. Nancy I, 54506 Vandoeuvre-les-Nancy, Fr.). *Journ. Calorim., Anal. Therm. Thermodyn. Chim.* 1986, 17, 125-9 (Fr). The equil. phase diagram was constructed. The heats and entropies of formation and the heats of fusion of Zr_2Rh, ZrRh, Zr_3Rh, and $ZrRh_3$ were detd. by direct calorimetry and/or calcns. The Zr_2Rh is superconducting (T_c at 11.2 K) and is formed by a eutectic reaction at 1440 K. It has a tetragonal symmetry ($CuAl_2$) with a 6.488(3) and c 5.503(3) Å. The ZrRh compd. is congruent at 2208 K. A eutectic reaction leads to Zr_3Rh_5, with orthorhombic structure (NbRu) CsCl-type martensite transformation. Such a transformation is also obsd. for ZrRh. The compd. $ZrRh_3$ is formed by congruent reaction at 2183 K, and has the cubic Cu_3Au structure with a 392(1) Å. In the Rh-rich region the solid soln. is extended to 12 ± 2 at.% Zr, at 2013 K.

$(\Delta_f H, \Delta_f S, \Delta_m H)$

C. A. 1987, 107, N 2

ZrRu x

Ом. 25857

1986

Kuentzler R.,
Waterstrat R. M.

магний.
св-ва,
Ср;

J. Less-Common.
Metals, 1986, 125,
N 1-2, 261-275.

$Zr_2Pd_3(K)$ | om. 27620 | 1986

Ogawa T., Ikawa K.,

High Temp. Sci., 1986,

Afb; 22, N3, 179-193

$Zr_{75}Rh_{25}$ 1986

Пакеева Г. Х., Черноглеков Н. А. и др.

Ср; Ж. эксперим. и теор. физ., 1986, 90, N 4, 1357–1359.

(см. $Mg_{70}Zn_{30}$; I)

PdZr (K)

1987

108: 63521q **Standard enthalpies of formation of palladium-zirconium (PdZr) and palladium hafnium (PdHf).** Topor, Letitia; Kleppa, O. J. (James Franck Inst., Univ. Chicago, Chicago, IL 60637 USA). *Metall. Trans. A* 1987, 18A(11), 1989–94 (Eng). The enthalpies of formation of the intermetallic compds. PdZr and PdHf were detd. by high-temp. mixing calorimetry at 1400 K. The results are compared with estd. and predicted literature values and with approx. exptl. values recently obtained by direct high-temp. reaction calorimetry. The enthalpies of formation of the equint. alloys of the Ti-group metals with Pd show increasing neg. values in the series TiPd < ZrPd < HfPd.

$\Delta_f H_i$

PdHf (K)

C.A. 1988, 108, N8

RhZr

om. 27992

om 28905

1987

107: 206183v Standard enthalpies of formation of rhodium titanium (RhTi), rhodium zirconium (RhZr) and rhodium hafnium (RhHf). Topor, Letitia; Kleppa, O. J. (James Franck Inst., Univ. Chicago, Chicago, IL 60637 USA). *J. Less-Common Met.* 1987, 135(1), 67–75 (Eng). The std. enthalpies of formation of the intermetallic compds. RhTi, RhZr and RhHf were detd. by high-temp. mixing calorimetry at 1400 K. The results are compared with the values predicted in the literature and with a recent exptl. value for RhZr. Comparison of the new data with the recently published results for the corresponding compds. of Pd with Ti, Zr and Hf show that in both families there are increasing neg. enthalpies of formation in the sequence TiX < ZrX < HfX.

$\Delta_f H$;

(±2)

RhTi, RhHf

C.A. 1987, 107, N 22

$Zr_{81}Rh_{19}$ 1987

J 107: 88519n A study of the thermodynamics of the crystalline-to-amorphous transformation in zirconium-based hydrides by means of thermal analysis. Yeh, X. L.; Cotts, E. J. (W. M. Keck Lab., California Inst. Technol., Pasadena, CA 91125 USA). *J. Mater. Res.* 1987, 2(2), 173–7 (Eng). Amorphous Zr–Rh and Zr–Pd hydrides were prepd. both by hydriding metallic glasses and by hydriding metastable, polycryst. fcc. alloys. The thermal stabilities of the amorphous hydrides produced by these 2 distinct methods were examd. by DSC and are similar. The enthalpy difference between the fcc. phase and the amorphous phase of $Zr_{81}Rh_{19}$ is 0.6 kcal/mol. The thermal stability of Zr–Rh hydrides as a function of H concn. was studied.

($\Delta_{tr}H$)

C. A. 1987, 107, N 10

Zr-Rh

OM-28681

1988

108: 138628r **Phase relations, thermochemistry and superconductivity in the zirconium–rhodium system.** Jorda, J. L.; Graf, T.; Schellenberg, L.; Muller, J.; Conzuni, K.; Gachon, J. C.; Hertz, J. (Dep. Phys. Matlore Condensee, Univ. Geneve, CH-1211 Geneva, Switz.). *J. Less-Common Met.* 1988, 136(2), 313–28 (Eng). The phase relations in the Zr–Rh system were reinvestigated by DTA, levitation thermal anal., z-ray anal., electron microprobe anal., microstructural examn., and measurements of the superconducting transition temps. A new complete phase diagram is presented. Owing to the occurrence of martensitic transformations, the central part of the diagram is particularly complicated. Obsd. enthalpies of formation are given for 3 intermediate compds.

phase diagr.

Zr_xRh_y

($\Delta_f H$)

C.A. 1988, 108, N16

ZrRhx

От 28681

1988

12 Б3023. Фазовые соотношения, термохимия и сверхпроводимость в системе Zr—Rh. Phase relations, thermochemistry and superconductivity in the Zr—Rh system. Jorda J. L., Graf T., Schellenberg L., Muller J. Cenzual K., Gachon J. C., Hertz J. «J. Less-Common Metals», 1988, 136, № 2, 313—328 (англ.)

Фазовые соотношения в системе Zr—Rh повторно исследованы методами ДТА, левитац. термич. анализа, РФА, изучения микроструктуры, измерения т-р перехода в сверхпроводящее состояние (T_c) и калориметрич. определения теплот образования. Представлена новая полная фазовая диаграмма системы. В дополнение к граничным тв. р-рам (α- и β-Zr) и родию идентифицированы 6 промежуточных однофазных обл. Обсуждается усложнение центральной части фазовой диаграммы в связи с мартенситным превращением при 670° С в обл. существования ZrRh. Значения T_c составили: 6,5 К для области β-Zr (до 20 ат.% Rh); 11,3—11,4 К в

ΔHf, Tt2

Х. 1988, 19, N 12

области Zr_2Rh (I), соотв-щей 33—40% Rh; 2,4 К в области ZrRh (II) и <1,1 К для составов с содержанием ⩽52 ат.% Rh в обл. Zr_3Rh_4, Zr_3Rh_5, $ZrRh_3$ (III). Крист. структура Zr_3Rh_4. полученного твердофазной р-цией, пока не установлена. Для I—III значения $-\Delta_f H°$ составили соотв. 55,4; 75,8 и 72,0 кДж/моль.

А. С. Гузей

Zr_2Rh
$ZrRh$
$ZrRh_3$

Оп 29752 1988

22 Б3183. Высокотемпературное исследование системы цирконий—родий. High temperature study of the zirconium-rhodium system. Jorda J. L., Gachon J. G., Charles J., Hertz, J. «J. Therm. Anal.», 1988, 34, № 2, 551—557 (англ.; рез. нем., рус.)

Представлены высокот-рная ($T>1600$ K) часть фазовой диаграммы и калориметрич. исследования двойной системы Zr—Rh. На сложной фазовой диаграмме идентифицированы пять интерметаллич. соединений Zr_2Rh, ZrRh, Zr_3Rh_4, Zr_3Rh_5 и $ZrRh_3$. Измеренные энтальпии образования фаз Zr_2Rh, ZrRh и $ZrRh_3$ были уточнены на основе оптимизации фазовой диаграммы. Предложено термодинамич. описание данной системы.

Резюме

ΔH_f

X. 1988, N 22

Zr_2Rh
$ZrRh$
$ZrRh_3$

Om. 29752

1988

109: 177574k High temperature study of the zirconium-rhodium system. Jorda, J. L.; Gachon, J. C.; Charles, J.; Hertz, J. (Lab. Thermodyn. Metall., Univ. Nancy I, 54506 Vandoeuvre-les-Nancy, Fr.). *J. Therm. Anal.* 1988, 34(2), 551–7 (Eng). High temp. (T >1600 K) part of the phase diagram and calorimetric studies in the binary Zr-Rh system are presented. Five intermetallic compds.: Zr_2Rh, ZrRh, Zr_3Rh_4, Zr_3Rh_5 and $ZrRh_3$ are present in the phase diagram. The enthalpies of formation of Zr_2Rh, ZrRh and $ZrRh_3$ were measured and refined from an optimization of the phase diagram. A thermodn. description of the system is proposed.

($\Delta_f H$)

C.A. 1988, 109, N 20

Y_2Z_2 | Om 31395 | 1988

Topor L., Klepa O.F.,

$\Delta_f H_m^\circ$ J. Chem. Thermodyn. 1988, 20, N11, 1271–1282.

RuZr (Om 31395) 1988

Topor Letitia,
Kleppa O.J. et al.

(4f4°) Metall. Trans. A 1988,
19A (4), 1061-6.

(cer. RuTi ; I)

PtZr (Dm 31395) 1988

Topor Letitia, Kleppa O.J.

(D+M) Metall. Trans. A 1988, 19A (7), 1827-31.

C.A. 1988, 109, N 12, 97191t

Zr_3RhH_x

1989

/ 112: 84668r Thermal stability and structural studies of annealed glassy zirconium–rhodium (Zr_3Rh) alloy and zirconium–rhodium (Zr_3Rh) hydrides. Cantrell, J. S.; Beiter, T. A.; Bowman, R. C., Jr. (Chem. Dep., Miami Univ., Oxford, OH 45056 USA). *Z. Phys. Chem. (Munich)* 1988 (Pub. 1989). 163(2), 331–6 (Eng). Zr_3Rh, detd. from powder data (XRD), is tetragonal, space group $P\bar{4}$, with a 1.0801(4), and c 0.5629(4) nm, $Z = 8$. The predominately tetragonal site H-occupancy, as found by inelastic neutron scattering for the a-$Zr_3RhH_{3.7}$, agreed with the reported structure assuming the glass is fairly close to the reported structure in atom locations.

Черницек. Славинн.

C.A. 1990, 112, N10

PdZ2 (cm 32738) 1989

RhZ2 Topor L., Kleppa O. J.,

RuZ2

PtZ2 J. Less-Common. Metals,

IrZ2 1989, 155, N1, 61-73.

S+H,

ZrPdDx

1990

(Cp)

113: 47606u **Low-temperature heat capacity of palladium zirconium deuteride ($Pd_{0.35}Zr_{0.65}D_x$; x = 0.00–0.80).** Kai, K.; Suzuki, K.; Gaschneidner, K. A., Jr. (Ames Lab., Iowa State Univ., Ames, IA 50011 USA). *Phys. Rev. B: Condens. Matter* 1990, 41(15), 10852–5 (Eng). Electronic properties of amorphous deuterated alloys prepd. from glassy $Pd_{0.35}Zr_{0.65}$ were studied by means of low-temp. heat-capacity measurements. Although the bare electronic d. of states $N_b(E_F)$ decreases steadily with increasing deuterium concn., the superconducting transition temp. T_c is const. for [D]/[M] higher than 0.5, in turn, according to W. L. McMillan (1963) anal., the electron-phonon interaction parameter λ is const. These results support the structural model that the deuterium atoms predominantly occupy the tetrahedral sites assocd. with Zr-rich atoms. But there is evidence of different sites occupancies, presumably octahedral sites, for higher deuterium concns., as indicated from neutron total scattering measurements.

C.A. 1990, 113, N 6

ZrPdxDg

1990

6 Е291. Низкотемпературная теплоемкость металлических стекол $Pd_{0,35}Zr_{0,65}D_x$ ($x=0,00—0,80$). Low-temperature heat capacity of $Pd_{0,35}Zr_{0,65}D_x$ ($x=0,00—0,80$) metallic glasses / Kai K., Suzuki K., Gschneidner K. A., (Jr.) // Phys. Rev. B.— 1990.— 41, № 15.— С. 10852—10855.— Англ.

(Cp)

С помощью адиабатич. калориметра в режиме тепловых импульсов в интервале т-р 1,5—20 К, измеренных с точностью от 0,5 до 1,5 мК, определена теплоемкость C ленты аморфного сплава массой ~0,2 г. Анализ результатов с помощью приближения $C=\gamma T+\beta T^3+\delta T^5$ показывает, что с ростом x убывает плотность электронов на уровне Ферми и вклад фононного спектра в теплоемкость. В то же время критич. т-ра сверхпроводимости остается неизменной, что свидетельствует о неизменности константы электрон-фононного взаимодействия. Это подтверждает предположение, что атомы дейтерия занимают преимущественно тетраэдрич. положения, окруженные атомами Zr. Библ. 21.

В. Оскотский

сф. 1991, №6

1990

ZrPtx Selhaoui Najim,
Gachon Jean Claude.

ΔH_f An. Fis., Ser. B 1990,
86 (2, Espec.), 57-9.

(cer. ● TiPtx ; I)

Pd_3Zr
Pd_2Zr

Ом 34606 1990

4 Е476. Масс-спектрометрическое изучение испарения сплавов палладий—цирконий. Mass spectrometric vaporization study on palladium—zirconium alloys / Stølen Svein, Matsui Tsuneo, Naito Keiji // J. Nucl. Mater.— 1990.— **173**, № 1.— С. 48—58.— Англ.

Эффузионным методом Кнудсена с масс-спектральным анализом продуктов испарения измерено парциальное давление Pd над твердыми растворами циркония в палладии Pd(ss) и над сплавами, принадлежащими областям двухфазного равновесия Pd(ss)+Pd_3Zr и Pd_3Zr+Pd_2Zr. Термодинамич. свойства твердых растворов находились на основе интегрирования ур-ния Гиббса—Дюгема для активности Pd. Изменения энтальпии для реакций разложения соединений Zr с Pd определены путем анализа по второму и третьему законам термодинамики измеренных величин давления пара Pd над сплавами, принадлежащими двухфазным областям. Полученные значения в даль-

$(K_p, \Delta H_f)$

Ф. 1991, N 4

нейшем использованы для расчета стандартных величин энтальпий образования интерметаллич. соединений (в кДж/моль): —346 для Pd_3Zr, —233 для Pd_2Zr. Оценена стандартная энтальпия образования промежуточной фазы $PdZr_2$: —126 кДж/моль. Построены диаграммы парциальных давлений компонентов в системе Pd—Zr—O. А. И. З.

Zr2PdHx

1991

5 Б3178. Исследование термической стабильности и фазового состава кристаллических гидридов Zr_2Pd. Thermal stability and phase studies of crystalline Zr_2Pd hydrides: [Pap.] Int. Symp. Metal—Hydrogen Syst., Fundam., and Appl., Banff, Sept. 2—7, 1990. Pt A / Cantrell J. S., Bowman (Jr) R. C. // J. Less—Common Metals.— 1991.— 172—174, Pt A.— С. 29—35.— Англ.

Методами ДСК и РФА исследованы фазовые превращения при термич. разложении крист. Zr_2PdH_x (тетрагон. модификация при $x<2{,}0$ и ромбич. при $x>2{,}9$) в сравнении с аморф. Zr_2PdH_x. Крист. гидриды получены нагревом Zr_2Pd в атмосфере H_2 при 750 К ($x<2{,}0$) и 510—550 К ($x>2{,}9$). При их нагреве наблюдается эндотермич. переход (550 К) ромбич. Zr_2PdH_x в тетрагон. фазу, сопровождающийся выделением H_2, что указывает на более высокую устойчивость водорода в тетраэдрич. пустотах Zr_4 по сравнению с октаэдрич. При 800—100 К происходит разл. тройного гидрида с образованием ZrH_x, ZrO_x и ZrPd.

Е. М.

термическое разложение

Х.1992, N5

Pd-Zr

Dm 36262

1992

116: 137170p **Thermodynamic analysis of the palladium-zirconium system.** Stoelen, Svein; Matsui, Tsuneo (Dep. Chem., Univ. Oslo, 0315 Oslo, Norway). *J. Nucl. Mater.* 1992, 186(3), 242-9 (Eng). An anal. of the thermodn. properties and the phase diagram of the palladium-zirconium alloy system was performed. The Gibbs energy functions for the various stable phases were constructed and a phase diagram for the Pd-Zr system has been calcd. The calcd. properties are compared with thermochem. measurements and the phase diagrams recommended in previous reviews of the Pd-Zr system.

(фаз. диагр.)

C.A. 1992, 116, N 14

PdZr
PdZr2
Pd3Zr

Ом 36262 1992

11 Б3060. Термодинамический анализ системы палладий — цирконий. Thermodynamic analysis of the palladium — zirconium system / Stølen Svein, Matsui Tsuneo // J. Nucl. Mater.— 1992.— 186, № 3.— С. 242—249.— Англ.

Обобщены лит. данные по фазовым соотношениям и термодинамич. св-вам в системе Pd—Zr. На основе модели тв. р-ров замещения и с применением ур-ния Редлиха—Кистера рассчитаны термодинамич. х-ки системы. В системе образуются след. интерметаллиды: Pd_3Zr, плавящийся конгруэнтно при 2044 K, PdZr — при 1870 K (конгруэнтно) и $PdZr_2$ — при 1363 K (конгруэнтно), а также 2 перитектич., 2 эвтектич. и 2 эвтектоидных превращения. Результаты расчета хорошо согласуются с лит. данными. Энтальпии образования интерметаллидов, $\Delta_f H^0$, кДж/моль —317,25 —233,2 и —126,5 для Pd_3Zr, PdZr и $PdZr_2$ соответственно.

Л. Г. Титов

(Tm, ΔHf, Δf H°)

Х. 1992, № 11

Zr Pd x

Ст 36262 1992

5 Е652. Термодинамический анализ системы палладий—цирконий. Thermodynamic analysis of the palladium — zirconium system / Stolen Svein, Matsui Tsuneo // J. Nucl. Mater.— 1992.— 186, № 3.— С. 242—249.— Англ.

термодин. анализ

Проведен анализ термодинамич. свойств и построена фазовая диаграмма системы Pd—Zr, для которой характерны четыре интерметаллич. соединения Pd_3Zr, Pd_2Zr, PdZr и $PdZr_2$ и значительная взаимная растворимость. На основе ур-ния для энергии Гиббса создана компьютерная программа расчета термодинамич. величин. Вычислены активности Pd и Zr в зависимости от молярной доли Zr при разных т-рах. Библ. 25.

ф. 1992, N5

Rh - Zr

1993

119: 53694m The Rh-Zr (rhodium-zirconium) system. Arias, D.; Abriata, J. P. (Cent. At. Constituyentes, 8250 Buenos Aires, Argent.). *J. Phase Equilib.* 1993, 14(1), 110–17 (Eng). A review with 34 refs. The Rh-Zr equil. phase diagram is assessed and metastable phases, crystallog., supercond., and thermodn. outlined.

фазовая диаграмма

C. A. 1993, 119, N 6

Zr-Rh-Pd

1993

120: 174879c Low-temperature specific heat of zirconium-rhodium-palladium. Gey, W.; Eschner, W.; Galperin, Yu. M. (Inst. Techn. Phys., Tech. Univ. Braunschweig, D-38092 Braunschweig, Germany). *Phys. Rev. B: Condens. Matter* 1993, 48(21), 15666-71 (Eng). The sp. heats of glassy Zr-Rh-Pd alloys at low temps. were investigated. The results are interpreted within the framework of the model of soft at. potentials (V. G. Karpov et al., 1982, 1983). By using the exptl. data for the normal and superconducting states, low-energy vibrational excitation parameters are obtained.

Спектр. свойства

(Ср)

C.A. 1994, 120, N14

RuZr

1993

119: 122274p The Ru-Zr system (ruthenium-zirconium). Okamoto, H. (ASM Int., Japan). *J. Phase Equilib.* 1993, 14(2), 225–7 (Eng). A review with 8 refs. The equil. phase diagram is assessed, crystallog. data tabulated, and enthalpy of formation of RuZr given.

($\Delta_f H$)

C. A. 1993, 119, N12

PdZrF6

1994

22 Б3149. Магнитные исследования полиморфизма тройных фторидов палладия(2+) $PdM^{IV}F_6$ (M^{IV} = Zr, Sn, Hf). Polymorphisme et étude magnétique des fluorures ternaires de palladium (II) $PdM^{IV}F_6$ (M^{IV} = Zr, Sn, Hf) /Ruchaud N., Grannec J., Tressaud A. //J. Alloys and Compounds. .—1994 .—**205** ,№ 1—2 .—С. 17—20 .—Фр. ;рез. англ.

В диапазоне т-р 4,2—300 К измерением магнитных св-в и в диапазоне т-р 25—750° С методами ДТА, ДСК и РСТА исследовано фазовое поведение фторидов $PdMF_6$ (M = Zr, Sn, Hf), кристаллизующихся в упорядоченной структуре типа $LiSbF_6$ с пр. гр. $R\bar{3}$. При 150° С соед. с M = Zr и при 180° С соед. с M = Hf переходят с $\Delta_{tr}H$ = 0,42 и 0,47 кДж/моль и с $\Delta_{tr}S$ = 0,99 и 1,04 Дж/(К•моль) соотв. в кубич. высокот-рную фазу с пр. гр. $Fm\bar{3}m$. Определены т-рные зависимости спонтанной деформации кристаллов. Все три соед. показывают антиферромагнитное поведение с T = 5 (Zr), 6 (Sn) и 9 К (Hf). В. А. Ступников

Фазные превращения

(+2) IX

X. 1994, N22

PdSnF6, PdHfF6

Pd-Zr (термодинамические)

1994

122: 18006d **An experimental thermodynamic study of of the Pd-Zr system.** Selhaoui, N.; Gachon, J. C. (Laboratoire de Thermodynamique Metallurgique, Universite de Nancy, F-54506 Vandoeuvre-les-Nancy, Fr.). *High Temp. Sci.* 1991 (Pub. 1994). 32(2-3), 155-66 (Eng). The four solid intermediate compds. in the PdZr system have been submitted to direct reaction calorimetry to det. their enthalpies of formation. Results are as follows: $Pd_{0.33}Zr_{0.67}$ ΔH_f (1273 K) = -48,000 J/mol of atoms; $Pd_{0.50}Zr_{0.50}$ ΔH_f (1667 K) = -62,000 J/mol of atoms; $Pd_{0.67}Zr_{0.33}$ ΔH_f (1573 K) = -85,000 K/mol of atoms; $Pd_{0.75}Zr_{0.25}$ ΔH_f (1573 K) = -82,800 J/mol of atoms. Expts. are briefly described and the results are given and compared to those of the literature.

$Pd_{0.67}Zr_{0.33}$ и др. ($\Delta_f H$)

C.A. 1995, 122, N2

ZrRh

Ом. 40565

1994

Semenova E.L.,
Kudryavtsev Yu.V.,

(Tt2, Tm)

J. of Alloys and Compounds, 1994, 203, 165–168 (только 1 стр!)

Zr Hf | Dn. 40565 | 1994

Semenova E.L.,
Kudryavtsev Yu.V.,
(Tc, Tm) J. of Alloys and
Compounds,
1994
203, 165-168 (только
темп!)

Pt_3Zr (OM 37948) 1995

Qiti Guo and O. J. Kleppa,

ΔH_f° J. Phys. Chem., 1995, 99,

2854-2856

ZrPd

1996

124: 295919j **Crystallographic structures and phase transformations in ZrPd.** Bendersky, L. A.; Stalick, J. K.; Portier, R.; Waterstrat, R. M. (Materials Science and Engineering Laboratory, National Institute of Standards and Technology, Gaithersburg, MD 20899 USA). *J. Alloys Compd.* 1996, 236, 19–25 (Eng). Phase transformations and crystal structures in equiat. ZrPd were examd. by using in–situ heating and cooling in a transmission electron microscope and Rietveld refinement of high resoln. neutron powder diffraction data. Three phases were characterized (1) high–temp. cubic B2–type phase (Pm3m; Z = 1; a = 0.33597(3)nm) at 800° (2) orthorhombic CrB–type phase formed by martensitic transformation from the B2 phase (Cmcm; Z = 4; a = 0.33319(3)nm, b = 1.0301(1)nm and c = 0.44111(4)nm) at 400° (3) monoclinic variant of the CrB–type phase at room temp. (assumed space group Cm; Z = 8; a = 0.66611(6)nm, b = 0.87499(7)nm, c = 0.54235(6)-nm; β = 108.21(1)°). The monoclinic ⇌ orthorhombic phase transformation occurred reversibly at ~200°.

фаз. переход

C. A. 1996, 124, N 22

1997

F: Os2Zr , $Os_{17}Zr_{54}$, $OsZr_2$, OsZr
P: 1

19Б336. Система осмий-цирконий. Os-Zr (osmium-zirconium) / Okamoto H. // J. Phase Equilibria [бывш. Bull. Alloy Phase Diagr.]. - 1997. - 18, 4. - С. 405-408. - Англ.

На основе лит. данных построена фазовая диаграмма системы осмий-цирконий при т-рах 600-3033{°}С для всей области составов. Приведены данные по крист. структуре и параметрам решеток Os, Os[2]Zr, OsZr, OsZr[2], Os[17]Zr[54], 'альфа'-Zr, 'бета'-Zr.