Th-Cu

$Th_2Cu$, $ThCu_2$, $ThZn_2$, Str. type (1956
(кристал. стр-ра).

Baenziger N.C., Rundle R.E.,
Snow A.I.,

VIII 3924

Acta crystallogr.,
1956, 9, №1, 93-94.

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РЖ, 1957, 16Б

$Th_2Cu$, $ThCu_2$, $ThZn_2$, $Li_3Fe_3$ (1956
(кристал. стр-ра)
Baenziger N.C., Rundle R.E.
Snow A.I., VIII 3923
Acta crystallogr.,
1956, 9, N1, 93-94.

РЖ, 1957, 168

$ThNi_2$, $ThCu_2$, $ThAg_2$, $ThAu_2$ (1961)
$ThZn_2$, $ThCd_2$, $ThHg_2$, $ThGa_2$
(кристал. стр-ра)

VIII 3923

Вилдэн А.,
Acta crystallogr.,
1961, 14, №8, 860

РЖ, 1962, 5Б140

$Th_2Cu$, $Th_2Ag$, $Th_2Au$, $Th_7Fe_3$, (1965
$ThFe_3$, $Th_7Co_3$, $Th_7Ni_3$, $ThNi$
(Tm)

VIII 4089

Thomson J. R.,
J. Nucl. Mater.,
1965, 15, №2, 88-94.

15, Ал

РЖ, 1965, 22 Б452

$ThCu_2Si_2$ Nickl J., 1967
Sprenger H.

Naturwissenschaften, 54, N10, 248.

Монокристаллы соединений $HfCuSi$ (I) и $ThCu_2Si_2$ (II).

(см. I)

$Th_2Fe_{17}$, $Th_2Co_{17}$, $Th_2Ni_{17}$, $ThCo_5$, $ThNi_5$, $ThCu_4$, $ThNi_2$ ($\Delta G_f$, $\Delta H_f$, $\Delta S_f$) 1969 8

Magnani N.J., Skelton W.H., Smith J.F.,

U.S. At. Energy Comm., 1969, CONF-690801, ₹27-42 (anal.) VIII 3740

Thermodynamics of formation of the $Th_2Fe_{17}$, $Th_2Co_{17}$, $Th_2Ni_{17}$, $ThCo_5$, $ThNi_5$, $ThCu_4$ and $ThNi_2$ from electromotive force measurements.

M, B

12 CA 1970, 72, N6, 29550x

$Th_2Fe_{17}$, $Th_2Co_{17}$, $ThCo_5$, ($\Delta G$, $S^o$, $\Delta H_f$) 1969

$Th_2Ni_{17}$, $ThNi_5$, $ThNi_2$, $ThCu_4$ & VIII 2801

Magnani N. J.

U. S. At. Energ. Comm 1968, IS-T-264, 51pp.

Thermodynamic study of phase stability in the transition-metal rich phases of the thorium-iron, thorium-cobalt, and thorium-nickel systems and copper-rich phases of the thorium copper systems.

M. Hellbake CA, 1969, 71, N8, 33986v

8 VIII 4831 (1970

$ThCu_6$, $PrCu_6$, $NdCu_6$, $SmCu_6$, $GdCu_6$. Крист. стр-ра

Buschow K.H.J., Goot A.S. van der.

"J. Less-Common Metals," 1970, 20,

№ 4, 309-313 (англ.).

Кристаллическая структура некоторых соединений меди типа $RCu_6$.

Ат Мл 12

ЖМ, 1970, 10 И51

(... Оригинал)

1971

Er $Zn_5$, Ho $Zn_5$, Tu $Zn_5$, Lu $Zn_5$, Y $Zn_5$, Th $Cd_5$

VIII 5252 (Кристс. стр-ра)

Fornasini M. L. „J. Less-Common Metals", 1971, 25, n3, 329-332 (англ).

Кристаллическая структура интерметаллических соединений Yb; Er; Tu-, Lu-, Y $Zn_5$ и Th $Cd_5$.

ЭИ, 1972, 2И85

$ThCr_2Si_2$; $ThCr_2Ge_2$, $ThMn_2Si_2$, $ThMn_2Ge_2$ (1971
$ThFe_2Si_2$; $ThFe_2Ge_2$, $ThCo_2Si_2$, $ThCo_2Ge_2$;
$ThNi_2Si_2$; $ThNi_2Ge_2$, $ThCu_2Si_2$; $ThCu_2Ge_2$

Отеjес L., Bau Z., Tz VIII 498

Z. anorgan. und allgem. Chem.,

1971, 380, N1, 111-117

Магнитная восприимчивость соединений $ThMeX_2$ (Me - Cr, Mn, Fe, Co, Ni и Cu; X = Si и Ge)

G Eu Phys 1971

$ThCr_2Si_2$; $ThCr_2Ge_2$, $ThMn_2Si_2$, $ThMn_2Ge_2$,
$ThFe_2Si_2$; $ThFe_2Ge_2$, $ThCo_2Si_2$, $ThCo_2Ge_2$; (1971)
$ThNi_2Si_2$; $ThNi_2Ge_2$, $ThCu_2Si_2$; $ThCu_2Ge_2$

Отеjec L., Bau Z., Tt2 VIII 498

Z. anorgan. und allgem. Chem.,

1971, 380, N1, 111-117

Магнитная восприимчивость соединений $ThMeX_2$ (Me - Cr, Mn, Fe, Co, Ni и Cu; X = Si и Ge)

Ф Б М Рлеї 1971

$Th_2Cu$

VIII-5152

1971

(Tm)

113434m Thorium–copper system. Schiltz, R. J., Jr.; Stevens, E. R.; Carlson, O. N. (Inst. At. Res., Iowa State Univ., Ames, Iowa). *J. Less-Common Metals* 1971, 25(2), 175–85 (Eng). A binary phase diagram is proposed for the Th–Cu system based on thermal, microscopic, and x-ray analyses. Four compds. exist, viz. $Th_2Cu$, $ThCu_2$, "$ThCu_{3.6}$," and $ThCu_6$, which melt congruently at 1007, 1015, 1052, and 1055°, resp. Five eutectic reactions were found in this system; at 30 at. % Cu and 1000°, at 51 at. % Cu and 880°, at 74 at. % Cu and 980°, at 82 at. % Cu and 1020°, and at 93 at. % Cu and 935°. The terminal solid soly. of Th in Cu is negligible (<0.01 at. % Th).

(B)

C.A. 1971 75. 18

$Th_2Cu$, $ThCu_2$, $ThCu_3$, $ThCu_6$ (Tm) 1974

Schlitz R.J., Jr.; Stevens E.L., VIII 5152

Carlson O.N.

J. Less-Common Metals, 1971, 25,
N2, 175-85 (Anal.)

Thorium - copper system.

An (P) 10

Am CA, 1971, 75, N18, 113434m

$Th_2Cu$, $ThCu_2$, $ThCu_3$, $ThCu_6$ (Tm) 19?1

Schultz R.J., Jr.; Stevens E.R., Carlson O.N. VIII 5152

J. less-Common Metals, 19?1, 25, N2, 175-85 (Am.)

Thorium - copper system.

An (9?) 10

CA, 19?1, 75, N18, 113434m

$CuThCl_5$
$Cu_2ThCl_6$

VIII - 5510

1972

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Binnewies et al.

Z.Anorg.Allg,Chem. I972,395(I);77-8I.

complexes

● (см. $TlPbCl_3$; I)

$TePbCl_3$; $TeCdCl_3$; $TeThCl_5$; $Te_2ThCl_6$; (1972
$TeUCl_5$; $Te_2UCl_6$; $TeUCl_6$; $TeU_2Cl_9$; $CuThCl_5$;
$Cu_2ThCl_6$; $CuUCl_5$; $Cu_2UCl_6$; $CdPbCl_4$;
$BeFeCl_5$, $BeFe_2Cl_8$; $Be_2Fe_2Cl_{10}$;
$Be_3Fe_2Cl_{12}$; $Be_3Fe_2Cl_{12}$; $BeInCl_5$;
$Be_2In_2Cl_8$; $Be_2InCl_7$; $Be_3InCl_9$; $InInCl_5$,
$InInCl_5$; $BeZrCl_6$; $PbThCl_6$; $BeUCl_6$;
$BeUCl_8$; $In_2UCl_{10}$; $InUCl_8$; $ThUCl_8$ (cs.6)
(VIII 5 510) Binnewies M., Schaefer H.,
Z anorgan. und allgem. Chem., 1972, 393,
N 1, 72-81 U 10

ThCu$_x$

1974

210109g Thermodynamics of formation of thorium-copper alloys. Bailey, D. M.; Smith, J. F. (Ames Lab., Ames, Iowa). *Report* 1974, IS-M-40, 13 pp. (Eng). Avail. NTIS. From *Nucl. Sci. Abstr.* 1975, 32(5), Abstr. No. 12038. Electromotive force cells were used to det. the Gibbs free energies, enthalpies, and entropies of formation for $ThCu_6$, $ThCu_{3.6}$, $ThCu_2$, and $Th_2Cu$ from 729 to 1219°K. Solid $CaF_2$ was used as the electrolyte. Comparison of the present measurements with earlier measurements on the most Cu-rich phase shows that the free energies are reproducible by this technique to approx. 4%. The magnitudes of the entropies of formation were all measured as less than one cal/g-atom degree and are therefore phys. reasonable. The values for the entropies of formation of $ThCu_6$ [12507-18-5] and $ThCu_{3.6}$ were pos., that of $ThCu_2$ to be essentially zero, and that of $Th_2Cu$ [11091-80-8] to be neg. Comparison with data from other Th systems shows that pos. entropies of formation are atypical for binary intermetallic phases of Th. The free energies of formation of the Th-Cu phases were roughly one-half as neg. as values reported for Zr-Cu phases at comparable temps. and stoichiometries.

$\Delta G_f$, $\Delta H_f$
$\Delta S_f$

C.A. 1975.
83 N 26

IX 4795 (1974

$TlCdCl_3$, $TlPbCl_3$, $TlInCl_4$, $CuThCl_5$, $TlThCl_5$,
$CuUCl_5$, $TlUCl_5$, $Cu_2ThCl_6$, $CuTh_2Cl_9$, $Tl_2ThCl_6$,
$Cu_2UCl_6$, $Tl_2UCl_6$, $TlU_2Cl_9$, $CdPbCl_4$, $BeInCl_6$,
$ZnInCl_5$, $SnInCl_5$, $InUCl_8$, $Tl_2InCl_5$, $BeInCl_7$,
$Be_3InCl_9$, $ThUCl_8$, $Cu_4Cl_4$, $Cu_5Cl_5$, $Tl_2Cl_2$, $SnCl_4$,
$In_2Cl_6$, $Th_2Cl_8$, $U_2Cl_8$ (AHF)

Binnewies M., Schäfer H.

Z. anorg. und allg. Chem. 1974, 407, N3, 327-34 (нем)

Реф. Хим. 1975 35862 M

IX 4795 (1974

$TlCdCl_3$, $TlPbCl_3$, $TlInCl_4$, $CuThCl_5$, $TlThCl_5$,
$Cu_4UCl_5$, $TlUCl_5$, $Cu_2ThCl_6$, $CuTh_2Cl_9$, $Tl_2ThCl_6$,
$Cu_2UCl_6$, $Tl_2UCl_6$, $TlU_2Cl_9$, $CdPbCl_4$, $BeInCl_6$,
$ZnInCl_5$, $SnInCl_5$, $InUCl_8$, $Tl_2InCl_5$, $BeInCl_7$,
$Be_3InCl_9$, $ThUCl_8$, $Cu_4Cl_4$, $Cu_5Cl_5$, $Tl_2Cl_2$, $SnCl_4$,
$In_2Cl_6$, $Th_2Cl_8$, $U_2Cl_8$ (ΔHf)

Binnewies M., Schäfer H.

Z. anorg. und allg. Chem. 1974, 407, N3, 327-344 (нем.)

РЖ. Хим. 1975 35862

M

$ThCu_6$ — $ThCu_5$ — $Th_2Cu$ — $Th_2Cu$ — $ThCu_{3,6}$ — $\Delta G_f$, $\Delta H_f$ — $\Delta S_f$

84: 36040m Thermodynamics of formation of thorium–copper alloys. Bailey, D. M.; Smith, J. F. (Ames Lab., Iowa State Univ., Ames, Iowa). *Thermodyn. Nucl. Mater., Proc. Symp., 4th* 1974 (Pub. 1975). 2, 355–65 (Eng). IAEA: Vienna, Austria. Emf. cells were used to det. the Gibbs free energies, enthalpies and entropies of formation for $ThCu_5$, $ThCu_{3.6}$, $ThCu_2$ and $Th_2Cu$ at 729–1219°K. Solid $CaF_2$ was used as the electrolyte. Comparison of the present measurements with earlier measurements on the most Cu-rich phase shows that the free energies are reproducible by this technique to ~4%. The magnitudes of the entropies of formation were all measured as less than 1 cal/g-atom·° and are therefore phys. reasonable. The values for the entropies of formation of $ThCu_5$ and $ThCu_{3.6}$ are pos., that of $ThCu_2$ to be essentially 0, and that of $Th_2Cu$ to be neg. Comparison with data from other Th systems shows that pos. entropies of formation are atypical for binary intermetallic phases of Th. The free energies of formation of the Th–Cu phases are roughly one-half as neg. as values reported for Zr–Cu phases at comparable temps. and stoichiometries.

1974

C.A. 1976 84 N6

1974

ThFe, ThNi, ThCu, LaFe,
GdFe, GdCu, сплавы Pu и Np
(Тех) XVIII-1212

Giessen B.C.,
Report 1974, COO-3395-11, 11pp (Eng).
From Nucl. Sci. Abstr., 1974, 30 (12)
32763
10 Structural, thermal and electro-
nic properties of metastable binary
alloys of thorium and uranium...
C.A. 1975. 22 n24. 160398f

Б

1974.

$ThAl_x$, $ThB_x$, $ThBi_x$, $ThC_x$, $ThCo_x$, $ThCu_x$, $ThF_x$, $ThFe_x$, $ThHg_x$, $ThMg_x$, $ThN_x$, $ThNi_x$, $ThO_x$, $ThP_x$, $ThRe_x$, $ThRu_x$, $ThS_x$, $ThSi_x$, $ThZn_x$ (термодин. св-ва).

XVIII-202

Smith J. F.,
J. Nucl. Mater., 1974, 51 (1), 136-48.
Thermodynamic properties of binary thorium systems.

M, Ar (ср)

$ThCu_6$, $ThCu_{3,6}$, $ThCu_2$, $Th_2Cu$ ($\Delta G_f$, $\Delta H_f$, $\Delta S_f$). DT 3548 1975

XVIII-732

Bailey D. M., Smith J. F.,
Thermodyn. Nucl. Mater. Proc. Symp. 4th 1974 (Pub. 1975), 2, 355-65

Thermodynamics of formation of Th-Cu alloys.

C.A. 1976. 84 № 6. 36040m. Ar CP

$ThCu_6$, $ThCu_{3,6}$, $ThCu_2$, $Th_2Cu$ ($\Delta G_f$, $\Delta H_f$, $\Delta S_f$) (OM 3548) 1975

XVIII-732

Bailey D. M., Smith J. F.,
Thermodyn. Nucl. Mater. Proc.
Symp. 4th 1974 (Pub. 1975), 2,
355-65

Thermodynamics of formation
of Th-Cu alloys.

An (P)

6 C.A. 1976. 84 n° 6. 36040m.

Th x Cu

(XVIII - 552)

1975

$\Delta G_f$, $\Delta H_f$

Th x Fe

Th x Co

Th x Ni

Th x Zn

$\Delta H_f$

+4

+) 137656b Thermodynamic study of phase stability in the thorium-copper equilibrium system. Bailey, D. M. (Ames Lab., Ames, Iowa). *Report* 1975, IS-T-662, 45 pp. (Eng). Avail. Dep. NTIS. From *Nucl. Sci. Abstr.* 1975, 31(12), Abstr. No. 33876. The thermodns. of formation of the 4 intermediate phases in the thorium-copper equil. system were evaluated from emf. data obtained from solid state electrochem. cells with a calcium fluoride electrolyte. The free energies and enthalpies of formation are essentially const., in units of kcal/g-atom Th, for the thorium-poor phases in this system, a feature shared with the Th-Fe, Th-Co, and Th-Ni systems. The trend in the magnitude of the enthalpy of formation of the thorium-poor phases in the Th-Fe, Th-Co, Th-Ni, and Th-Zn systems is in accord with the bonding energies for the $dn$-$^2sp$ valence states for the respective transition metals (and for zinc): the value for the Th-Cu system is lower, corresponding more closely to the bonding energy of the monovalent $d^{10}s$ state for copper.

C.A 1975. 83 N 16

☒

$Th_x Cu$ (фазовая диаграмма, $\Delta Hf$, $\Delta Gf$). XVIII – 552 (1975

$Th_x Fe$, $Th_x Co$, $Th_x Ni$, $Th_x Zn$ ($\Delta Hf$).

Bailey D. M.;
Report 1975 IS-T-662, 45pp. (Eng).
From Nucl. Sci Abstr. 1975, 31 (12)
N 33876.

Thermodynamic study of phase stability in the Th-Cu equilibr. system.

Ar

$ThCu_6$, $ThCu_{3,6}$, $ThCu_2$, (1975)
$Th_2Cu$ ($\Delta G_f$, $\Delta H_f$, $\Delta S_f$) XVIII-756

Bailey D.M., Smith J.F.,
Anal. Sci. Abstr., 1975, 32 (5)
Abstr. N 10038.

Thermodynamics of formation of thorium-copper alloys.

5
C.A. 1975, 83 N26. 216109g

Au (P)

$ThCu_6$, $ThCu_{3,6}$, $ThCu_2$, (1975)
$Th_2Cu$ (aCf, aHf, aSf) XVIII-756
Bailey D.M., Smith J.F.,
Anal. Sci. Abstr., 1975, 32 (5)
Abstr. N 10C38.
Thermodynamics of formation
on of thorium-copper alloys.
5
C.A. 1975, 83 N26. 216109g

$ThCu_6$, $ThCu_{3,6}$, $ThCu_2$, (1975)
$Th_2Cu$ ($\Delta G_f$, $\Delta H_f$, $\Delta S_f$) XVIII-756

Bailey D.M., Smith Y.F.,
Nucl. Sci. Abstr., 1975, 32 (5)
Abstr. N 12038.

Thermodynamics of formation of thorium-copper alloys.

5
C.A. 1975, 83 N26. 210109g

Au (9p)

Th-Cu (термодин. св-ва) 1975

Bailey D. M., XVIII-713

Diss. Abstr. Int. B, 1975,

36 (2), 868.

Thermodynamic study of phase stability in the Th-Cu equilibrium system.

Ar (9)

C.A. 1975, 83 n22. 184512 m.

Cu-Th

1986

107: 13490n The Cu-Th (copper-thorium) system. Chakrabarti, D. J.; Laughlin, D. E.; Peterson, D. E. (Alcoa Lab., Alcoa Center, PA 15069 USA). *Bull. Alloy Phase Diagrams* 1986, 7(1), 36–43, 7-8 (Eng). The assessed phase diagram is presented. There are four congruently melting intermediate phases ($Cu_6Th$, $Cu_{3.6}Th$, $Cu_2Th$ and $CuTh_2$), two terminal solid solns., and five eutectic transformations. Neg. heats and free energies of formation point to strong compd.-forming tendencies. Crystal structures are given.

фазовая диаграмма

C.A. 1987, 107, N2

$Ce_{1-x}Th_x$

1987

108: 27192z **Valency instability of cerium in cerium-thorium ($Ce_{1-x}Th_x$).** Smirnov, Yu. P.; Sovestnov, A. E.; Terekhov, G. I.; Tyunis, A. V.; Shaburov, V. A. (Inst. Yad. Fiz. im. Konstantinova, Gatchina, USSR). *Zh. Eksp. Teor. Fiz.* 1987, 93(2), 692–700 (Russ). The occupation of the 4f-shell of Ce in $Ce_{1-x}Th_x$ is investigated by the x-ray line shift method in a broad range of compn., temp. and pressure ($0,05 \leq x \leq 0,95$, $77 \lesssim T \lesssim 1000$ K, $0 \lesssim P \lesssim 13,5$ kbar). During the so-called $\gamma$–$\alpha$ transition in $Ce_{1-x}Th_x$ ($T \lesssim 150$ K for $P \gtrsim 8$ kbar) the no. of 4f-electrons in Ce decreases and Ce in the $\alpha$ phase is in a state of intermediate valency. The valency value depends on the method of inducing the $\gamma$–$\alpha$ transition and decreases on approach to $x_{cr} \approx 0,27$. The valency of Ce in $Ce_{1-x}Th_x$ in the supercrit. region ($x > x_{cr}$, $T < T_{cr}$) is detd. for the first time. It is found that for $x_{cr} \lesssim x \lesssim 0,75$, $T = 77$ K, Ce also exists in the intermediate valency state with a valence $m = 3,06 \pm 0,0.1$ which does not depend on the compn. For $x \gtrsim 0,75$, $T \approx 300$ K a new electron transition from the $Ce^{3+}$ state to the intermediate valency state is obsd. The transition can be ascribed to the presence of a new phase ($\alpha^*$) on the phase $xT$-diagram for $Ce_{1-x}Th_x$. The reversible transition $\gamma \rightleftharpoons \alpha^*$ at $T \approx 400$ K is obsd. A new $xT$-diagram for $Ce_{1-x}Th_x$ is proposed. The magnitude of the intermediate valency of Ce in $Ce_{1-x}Th_x$ and its difference from the intermediate valency of metallic Ce are explained on the basis of an approach which takes into account the final state of the 4f-electron on formation of the intermediate valency state.

C.A. 1988, 108, N4