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The excess enthalpies of liquid Ag–Ga–Te and Ag–In–Te alloys

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Abstract

The excess enthalpies of liquid alloys in the ternary systems Ag–Ga–Te and Ag–In–Te were determined in a heat flow calorimeter for four sections Ag_yGa_yTe with $y = 0.2$, 0.4, 0.5, and 0.6 at 1173 K, for the section $Ag_{0.5}Ga_{0.5}$–Te at 1073 K, for five sections Ag_yIn_{1-y}–Te with $y = 0.2$, 0.4, 0.5, 0.6, and 0.8 at 1173 K, and for the section $Ag_{0.5}In_{0.5}$–Te at 973 and 1073 K.

The thermodynamic functions of the system Ag–Ga and Ag–In were optimized, using the association model and the Lukas program to get a reliable data base for the calculation of ternary thermodynamic data.

However, ternary interactions had to be considered for the analytical description of the excess enthalpies of the liquid Ag–Ga–Te and Ag–In–Te alloys. The enthalpy surface of both systems is characterized by a valley of exothermic minima from the congruently melting compound Ag_2Te to Ga_2Te_3 or In_2Te_3. The numerical values of the enthalpies decrease with increasing temperature by dissociation of binary telluride associates.

Keywords: Liquid alloys; Enthalpies of mixing; Ag–Ga–Te; Ag–In–Te; Optimization; Ag–Ga; Ag–In

1. Introduction

The behavior of melts of binary systems with chalcogen as one constituent component differs considerably from that of melts with metallic bond character. The thermodynamic data of chalcogen systems exhibit more or less triangular shaped functions of the composition. The apex of the triangle corresponds to the composition of a congruently melting compound of the systems. Such a behavior was for the first time observed and explained by Wagner [1]. He assumed that either an electron transfer to the more electronegative chalcogen or covalent bonding between metal and chalcogen cause this effect. Melts of these system reveal a similar behavior in other physical properties like viscosity, electrical or thermal conductivity, too.

During a systematic survey of the enthalpies of mixing of ternary alloys with tellurium [2] we have now investigated the systems Ag–Ga–Te and Ag–In–Te.

2. Experimental

The measurements were performed with the aid of a high temperature heat flow calorimeter [3] in the isoperibolic procedure. The experimental arrangement and the procedure to determine excess enthalpies of liquid alloys have been described previously [4]. Ag (Degussa, 99.95%), Ga (Ingal, 99.999%), In (Degussa, 99.999%), and Te (ABCR, 99.999%) were used for the experiments. Ag_yM_{1-y} alloys ($y = 0.2$, 0.4, 0.5 and 0.6 with M = Ga; $y = 0.2$, 0.4, 0.5, 0.6 and 0.8 with M = In) were by prepared weighing appropriate amounts of Ag and M (M = Ga, In) into silica ampoules which were evacuated and then sealed. The ampoules were heated to melt and mix the

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components, annealed below the solidus temperature of the alloys for 14 d and then slowly cooled to room temperature. The measurements started on the metal rich side of the sections Ag_yM_{1-y}–Te with Ag_yM_{1-y} alloys, which were brought into the calorimeter tube and allowed to heat to the temperature of the measurement. Small amounts of pure Te at 298 K were consecutively added to the melt. On the tellurium rich part of the sections small amounts of Ag_yM_{1-y} were successively added to liquid tellurium. The enthalpy increments $H(T-298\ K)$ of Ag_yM_{1-y} and Te were needed to calculate the excess enthalpies of the ternary alloys. These data were determined by dropping Ag_yM_{1-y} or Te from ambient temperature into liquid Ag_yM_{1-y}, or Te, respectively. The temperatures of these measurements were the same as for the determination of enthalpies of mixing. A calibration was carried out after each measurement by dropping pieces of tin into a second tube, which ends in the liquid alloy. The enthalpy increments $H(T-298\ K)$ of tin were taken from Barin [5]. The reproducibility of the heat effects was better than ±5%. All experiments were carried out under dry argon gas at atmospheric pressure.

3. Binary systems

3.1. Phase diagrams

The five binary systems are well known [6]. Intermediate phases in the system Ag–Te are the liquid with a miscibility gap and the compounds $Ag_{1.9}Te$, Ag_5Te_3 and Ag_2Te, only the latter melts congruently. The system Ga–Te has a small miscibility gap within its galliumrich part and four intermetallic compounds, of which GaTe and Ga_2Te_3 melt congruently. Ga_3Te_2 decomposes peritectically and Ga_2Te_5 is a peritectic high temperature phase. The system In–Te is similar, but contains more intermediate phases, namely four compounds, In_4Te_3, In_3Te_4, In_2Te_5, and In_3Te_2, which decompose peritectically, the congruently melting phases InTe and In_2Te_3, as well as a miscibility gap on the indiumrich side of the system. The properties of melts in the systems Ag–Te, Ga–Te, and In–Te are determined by associates, which are derived from the congruently melting compounds Ag_2Te, Ga_2Te_3, and In_2Te_3. The appearance of associates with compositions M_2Te_3 is surprising, because the compounds GaTe and InTe melt at higher temperatures than Ga_2Te_3 and In_2Te_3.

The system Ag–Ga was recently reinvestigated [7], it contains two peritectic compounds: one in the silverrich region with a broad homogeneity range and the line compound AgGa. The system Ag–In is similar except that the composition of the line compound is $AgIn_2$.

3.2. Analytical descriptions

The thermodynamic functions of the melts were optimized with the programs BINGSS and BINFKT [8,9]. The association model of Sommer [10,11] was used for the analytical description of the melts with the assumption of the associates Ag_3Ga, Ag_3In, Ag_2Te, Ga_2Te_3 and In_2Te_3, respectively. The coefficients according to the SGTE description of the temperature dependence of the Gibbs energy for the pure elements were taken from Dinsdale [12] and Feutelais et al. [13]. Thermodynamic data which were considered in the optimization of Ag–Ga and Ag–In are collected in Table 1. The coefficients of all limiting binaries obtained from the optimizations are presented in Tables 2 and 3.

The calculated thermodynamic functions are compared with some experimental data of the systems Ag–Ga and Ag–In in Figs. 1–5. Excess enthalpies of the Ag–Ga system (Fig. 1) are at 773 K nearly triangular shaped functions of the composition with a minimum at 25 mol% Ga (Ag_3Ga). The curve has a more rounded form at higher temperatures, which indicates a diminishing concentration of associates. Chemical potentials of gallium at 980 K are depicted in Fig. 2. Excess and formation enthalpies of the Ag–In system are given in Figs. 3 and 4, the chemical potentials of Ag and In at 1173 K in Fig. 5.

4. Ternary systems

4.1. Phase diagrams

The phase diagram Ag–Ga–Te was investigated by Guittard et al. [24]. The system is divided by the quasibinary section Ag_2Te–Ga_2Te_3 which contains the compounds Ag_9GaTe_6, $AgGaTe_2$, and $AgGa_5Te_8$

Table 1
Thermodynamic investigations of the system Ag–Ga and Ag–In[a]

Reference	Method	Function	Temperature (K)	Concentration x_{Ga}	
Ag–Ga					
[13]	Calorimetry	H^E	773	0.413–0.992	+
[14]	Calorimetry	H^E	1243	0.13–0.87	+
[15]	Calorimetry	H^E	773–1028	0.1–0.8	+
[16]	Calorimetry	H^E	1050	0.102–0.880	+
[17]	EMF	μ_{Ga}	780–1020	0.3–0.9	+
Ag–In					
				Concentration x_{In}	
[18]	Calorimetry	H^{for}	723	0.672–0.945	+
[19]	EMF	μ_{In}	673–973	0.05–0.95	+
[20]	Calorimetry	H^E	1248	0.05–0.95	+
[21]	EMF	μ_{In}	1000–1020	0.208–0.823	−
[15]	Calorimetry	H^E	773	0.628–0.951	+
[14]	Calorimetry	H^E	1243	0.105–0.904	+
[22]	Knudsen-MS	μ_{Ag}, μ_{In}	1173–1473	0.1–0.9	+
[23]	Calorimetry	H^E	1280	0.10–0.95	+

[a] '+': used, '−': rejected.

Table 2
Analytical description of the systems Ag–Ga and Ag–In

Phase	Analytical description	Parameter		Parameter	
Melt	Association model	$\Delta H^0_{Ag_3Ga}$ (J mol^{-1})	−33590	$\Delta H^0_{Ag_3In}$ (J mol^{-1})	−60250
		$\Delta S^0_{Ag_3Ga}$ (J mol^{-1} K^{-1})	−2.489	$\Delta S^0_{Ag_3In}$ (J mol^{-1} K^{-1})	−44.22
		C^H_{Ag,Ag_3Ga} (J mol^{-1})	−1437	C^H_{Ag,Ag_3In} (J mol^{-1})	37510
		C^S_{Ag,Ag_3Ga} (J mol^{-1} K^{-1})	−6.034	C^S_{Ag,Ag_3In} (J mol^{-1} K^{-1})	46.28
		$C^H_{Ag,Ga}$ (J mol^{-1})	1530	–	
		$C^S_{Ag,Ga}$ (J mol^{-1} K^{-1})	16.34	–	
		C^H_{Ga,Ag_3Ga} (J mol^{-1})	8810	C^H_{In,Ag_3In} (J mol^{-1})	39470
		C^S_{Ga,Ag_3Ga} (J mol^{-1} K^{-1})	20.14	C^S_{In,Ag_3In} (J mol^{-1} K^{-1})	75.41

Table 3
Parameters of the association model of the binary tellurium systems

Parameter	Ag–Te	Ga–Te	In–Te
i, j	2,1	2,3	2,3
$\Delta H^0_{A_iTe_j}$ (J mol^{-1})	−67847.34	−292372.40	−248868.26
$-\Delta S^0_{A_iTe_j}$ (J mol^{-1} K^{-1})	13.12515	173.67977	145.21077
C^H_{A,A_iTe_j} (J mol^{-1})	28303.06	184470.13	73767.95
$-C^S_{A,A_iTe_j}$ (J mol^{-1} K^{-1})	−3.81835	−210.74260	−177.36618
$C^H_{A,Te}$ (J mol^{-1})	–	–	−57983.18
$-C^S_{A,Te}$ (J mol^{-1} K^{-1})	–	–	2.87127
C^H_{B,A_iTe_j} (J mol^{-1})	20048.28	124796.04	62674.69
$-C^S_{B,A_iTe_j}$ (J mol^{-1} K^{-1})	−23.31501	−126.18462	−95.48235

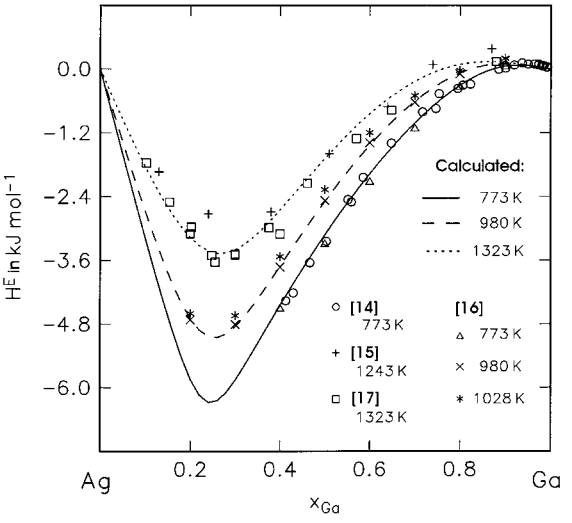

Fig. 1. Experimental and calculated excess enthalpies of liquid Ag–Ga alloys.

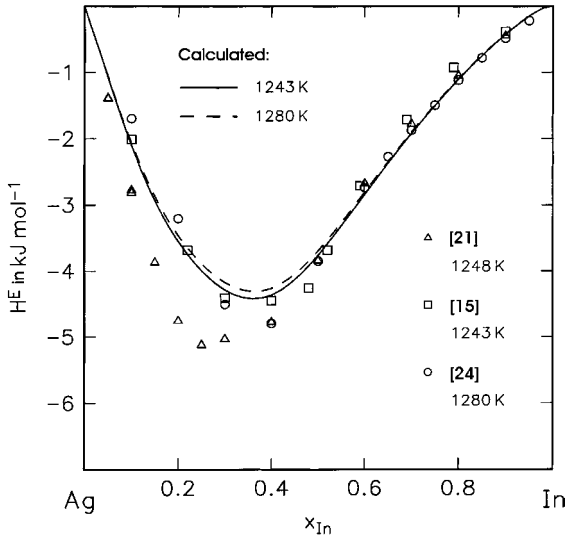

Fig. 3. Experimental and calculated excess enthalpies of liquid Ag–In alloys.

[25–32]. Phase equilibria in the system Ag–In–Te have been determined by Bahari et al. [33,34]. The quasibinary section Ag_2Te–In_2Te_3 [35–38] divides the phase diagram into two subsystems. Two compounds were observed with the formal composition $AgInTe_3$ and $AgIn_5Te_8$, both with broad homogeneity ranges. Thermodynamic investigations have not been reported for these systems.

4.2. Analytical description

Ternary parameters have to be considered for systems containing tellurium if thermodynamic data of ternary phase diagrams are calculated from the

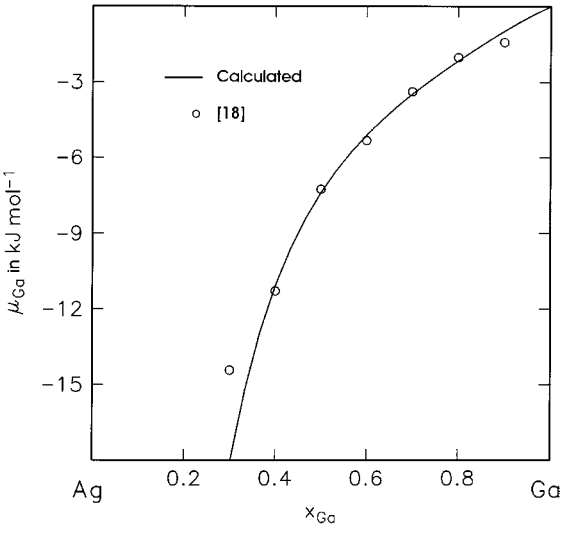

Fig. 2. Experimental and calculated chemical potentials of gallium in liquid Ag–Ga alloys at 980 K.

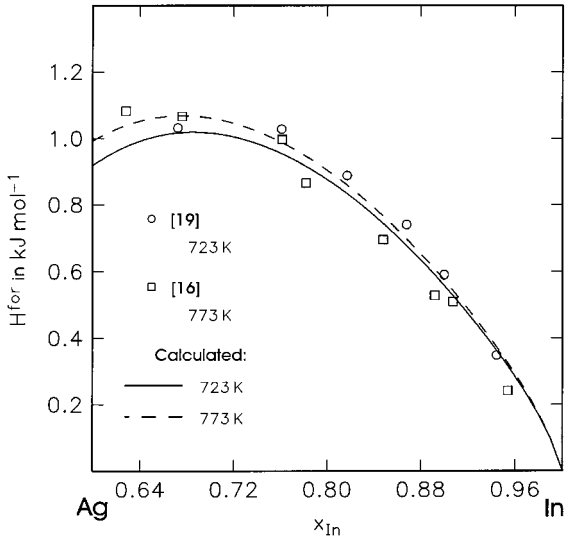

Fig. 4. Experimental and calculated enthalpies of formation of liquid Ag–In alloys obtained from solid Ag and liquid In.

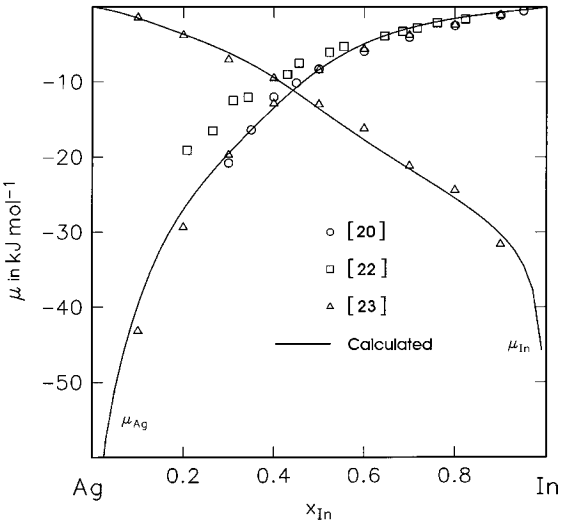

Fig. 5. Experimental and calculated chemical potentials of Ag and In in liquid Ag–In alloys at 1173 K.

constituent binaries. These parameters represent interactions between an associate of a binary system with tellurium or a component metal or between two different associates. The calculation of the excess enthalpies H^{E}_{A-B-Te} was performed with the aid of the general Eq. (1).

$$
\begin{aligned}
H^{E}_{A-B-Te} = {} & n\mathrm{A}_i\mathrm{B}_j \cdot \Delta H^{0}_{\mathrm{A}_i\mathrm{B}_j} + \frac{n_{\mathrm{A}} \cdot n_{\mathrm{B}}}{n} \cdot C^{H}_{\mathrm{A,B}} \\
& + \frac{n_{\mathrm{A}} \cdot n_{\mathrm{A}_i\mathrm{B}_j}}{n} \cdot C^{H}_{\mathrm{A},\mathrm{A}_i\mathrm{B}_j} + \frac{n_{\mathrm{B}} \cdot n_{\mathrm{A}_i\mathrm{B}_j}}{n} \cdot C^{H}_{\mathrm{B},\mathrm{A}_i\mathrm{B}_j} \\
& + n_{\mathrm{A}_k\mathrm{Te}_l} \cdot \Delta H^{0}_{\mathrm{A}_k\mathrm{Te}_l} + \frac{n_{\mathrm{A}} \cdot n_{\mathrm{Te}}}{n} \cdot C^{H}_{\mathrm{A,Te}} \\
& + \frac{n_{\mathrm{A}} \cdot n_{\mathrm{A}_k\mathrm{Te}_l}}{n} \cdot C^{H}_{\mathrm{A},\mathrm{A}_k\mathrm{Te}_l} + \frac{n_{\mathrm{Te}} \cdot n_{\mathrm{A}_k\mathrm{Te}_l}}{n} \\
& \cdot C^{H}_{\mathrm{Te},\mathrm{A}_k\mathrm{Te}_l} + n_{\mathrm{B}_u\mathrm{Te}_v} \cdot \Delta^{0}_{\mathrm{B}_u\mathrm{Te}_v} + \frac{n_{\mathrm{B}} \cdot n_{\mathrm{Te}}}{n} \\
& \cdot C^{H}_{\mathrm{B,Te}} + \frac{n_{\mathrm{B}} \cdot n_{\mathrm{B}_u\mathrm{Te}_v}}{n} \cdot C^{H}_{\mathrm{B},\mathrm{B}_u\mathrm{Te}_v} \\
& + \frac{n_{\mathrm{Te}} \cdot n_{\mathrm{B}_u\mathrm{Te}_v}}{n} \cdot C^{H}_{\mathrm{Te},\mathrm{B}_u\mathrm{Te}_v} + \frac{n_{\mathrm{Te}} \cdot n_{\mathrm{A}_i\mathrm{B}_j}}{n} \\
& \cdot C^{H}_{\mathrm{Te},\mathrm{A}_i\mathrm{B}_j} + \frac{n_{\mathrm{B}} \cdot n_{\mathrm{A}_k\mathrm{Te}_l}}{n} \cdot C^{H}_{\mathrm{B},\mathrm{A}_k\mathrm{Te}_l} \\
& + \frac{n_{\mathrm{A}} \cdot n_{\mathrm{B}_u\mathrm{Te}_v}}{n} \cdot C^{H}_{\mathrm{A},\mathrm{B}_u\mathrm{Te}_v} + \frac{n_{\mathrm{A}_i\mathrm{B}_j} \cdot n_{\mathrm{A}_k\mathrm{Te}_l}}{n} \\
& \cdot C^{H}_{\mathrm{A}_i\mathrm{B}_j,\mathrm{A}_k\mathrm{Te}_l} + \frac{n_{\mathrm{A}_i\mathrm{B}_j} \cdot n_{\mathrm{B}_u\mathrm{Te}_v}}{n} \cdot C^{H}_{\mathrm{A}_i\mathrm{B}_j,\mathrm{B}_u\mathrm{Te}_v} \\
& + \frac{n_{\mathrm{A}_k\mathrm{Te}_l} \cdot n_{\mathrm{B}_u\mathrm{Te}_v}}{n} \cdot C^{H}_{\mathrm{A}_k\mathrm{Te}_l,\mathrm{B}_u\mathrm{Te}_v} \qquad (1)
\end{aligned}
$$

where n_i are moles of associates and constituent components, n the total moles, ΔH^{0}_{j} the enthalpies of formation of binary associates and C^{H} constant parameters.

If the metallic system A–B does not form associates in the melt, terms with associate $\mathrm{A}_i\mathrm{B}_j$ can be canceled.

5. Enthalpies of mixing

The heats of solution ΔQ of the sections $\mathrm{Ag}_y\mathrm{Ga}_{1-y}$–Te were determined for four sections with constant concentration ratio of the two components at 1173 K and in addition of the sections $\mathrm{Ag}_{0.5}\mathrm{Ga}_{0.5}$–Te at 1073 K, for five sections $\mathrm{Ag}_y\mathrm{In}_{1-y}$–Te at 1173 K, and for the section $\mathrm{Ag}_{0.5}\mathrm{In}_{0.5}$–Te at 973 and 1073 K.

The experimental enthalpies H^{E}_{exp} of the reaction

$$
\begin{aligned}
& (1-x)\mathrm{Ag}_y\mathrm{M}_{1-y}(1) + x\mathrm{Te}(1) \\
& \quad \rightarrow \mathrm{Ag}_{y(1-x)}\mathrm{M}_{(1-y)(1-x)}\mathrm{Te}_x(1) \qquad (2)
\end{aligned}
$$

with M = Ga, In and the ternary excess enthalpy H^{E} of the reaction

$$
\begin{aligned}
& (1-x)(y)\mathrm{Ag}(1) + (1-x)(1-y)\mathrm{M}(1) + x\mathrm{Te}(1) \\
& \quad \rightarrow \mathrm{Ag}_{y(1-x)}\mathrm{M}_{(1-y)(1-x)}\mathrm{Te}_x(1) \qquad (3)
\end{aligned}
$$

are presented in Tables 4 and 5, and in Figs. 6 and 7 for one representative section of each system. The excess enthalpies of liquid alloys in both systems are strongly temperature dependent, because associates dissociate with increasing temperatures, especially those formed in the systems Ga–Te and In–Te.

If the excess enthalpies of the ternary mixtures were only calculated from the data of the limiting binaries the curves were not well reproduced (dashed lines in Figs. 6 and 7), therefore these ternary interactions were taken into account. The best fits were obtained with the interactions and interaction parameters which are given in Table 6.

Figs. 8 and 9 show the isoenthalpics for the ternary excess enthalpies of the systems in a projection onto the Gibbs triangle. Exothermic minima are found near the section $\mathrm{Ag_2Te}$–$\mathrm{M_2Te_3}$.

Table 4
Heat of solution ΔQ, experimental excess enthalpies $H^{E}_{Ag_yGa_{1-y}Te}$ and ternary excess enthalpies $H^{E}_{Ag-Ga-Te}$ according to the reactions (1) and (2) along the section Ag_yGa_{1-y}–Te

Added amount, n_{Te} (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
Starting amount: $n_{Ag_{0.2}Ga_{0.8}} = 0.029540$ mol ($T = 1173$ K)				
0.001100	0.036	30.9	−581	−549
0.001488	0.081	29.0	−1707	−1676
0.001865	0.131	20.2	−3452	−3423
0.001945	0.178	7.7	−5449	−5422
0.002508	0.232	−3.7	−8082	−8056
0.002994	0.287	−32.8	−11493	−11469
0.003074	0.336	−61.9	−15153	−15130
0.003393	0.383	−98.1	−19268	−19248
0.003658	0.427	−137.3	−23709	−23690
0.003182	0.460	−109.1	−26901	−26883
0.002958	0.488	−78.9	−29163	−29145
0.002698	0.511	−19.8	−30169	−30152
Starting amount: $n_{Ag_{0.2}Ga_{0.8}} = 0.021306$ mol ($T = 1173$ K)				
0.001106	0.049	23.9	−1121	−1089
0.001691	0.116	24.9	−3119	−3089
0.001858	0.179	−7.3	−6352	−6324
0.001861	0.234	3.0	−8784	−8758
0.002087	0.288	−14.5	−11750	−11726
0.002463	0.342	−35.3	−15321	−15299
0.002573	0.390	−94.4	−20160	−20140
0.003197	0.441	−127.8	−25537	−25518
0.003162	0.484	−103.3	−29478	−29460
Starting amount: $n_{Ag_{0.4}Ga_{0.6}} = 0.025255$ mol ($T = 1173$ K)				
0.001257	0.047	37.9	−674	−1686
0.001639	0.103	22.6	−2413	−3366
0.001784	0.156	16.4	−4364	−5260
0.001915	0.207	8.0	−6516	−7358
0.001979	0.253	−1.9	−8785	−9578
0.002349	0.302	−22.8	−11724	−12466
0.002495	0.347	−43.5	−14954	−15648
0.002462	0.386	−55.9	−18071	−18723
0.002732	0.424	−73.7	−21387	−21999
0.003094	0.462	−81.3	−24631	−25202
0.002467	0.489	−31.5	−26252	−26795
0.002140	0.510	3.8	−26929	−27449
0.001803	0.527	27.4	−27003	−27506
Starting amount: $n_{Ag_{0.4}Ga_{0.6}} = 0.020731$ mol ($T = 1173$ K)				
0.000940	0.043	21.1	−951	−1967
0.001473	0.104	20.4	−2832	−3784
0.001672	0.165	14.4	−5048	−5936
0.001995	0.227	−1.3	−8020	−8841
0.002100	0.283	−20.7	−11375	−12136
Starting amount: $n_{Ag_{0.4}Ga_{0.6}} = 0.019076$ mol ($T = 1173$ K)				
0.001172	0.058	37.0	−739	−1739
0.001625	0.128	24.8	−2842	−3768
0.001818	0.195	12.1	−5518	−6373
0.001966	0.256	1.5	−8436	−9226
0.002548	0.324	−32.6	−12835	−13553
0.002549	0.380	−52.8	−17162	−17821

Table 4 (*Continued*)

Added amount, n_{Te} (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
0.002998	0.435	−74.2	−21776	−22376
0.003150	0.483	−63.4	−25419	−25968
0.003315	0.526	25.7	−26341	−26845
0.002596	0.554	102.3	−25044	−25518
Starting amount: $n_{Ag_{0.5}Ga_{0.5}} = 0.023206$ mol ($T = 1073$ K)				
0.000927	0.038	22.4	−701	−2857
0.001214	0.084	3.4	−2565	−4617
0.001676	0.141	5.1	−4849	−6775
0.002392	0.211	3.2	−7796	−9564
0.002434	0.271	−0.2	−10450	−12083
0.002738	0.329	−39.7	−14129	−15633
0.002808	0.379	−115.3	−19336	−20728
0.003346	0.430	−166.5	−25320	−26597
0.003242	0.472	−95.3	−28747	−29930
0.003563	0.512	65.1	−28403	−29497
Starting amount: $n_{Ag_{0.5}Ga_{0.5}} = 0.017981$ mol ($T = 1073$ K)				
0.001190	0.062	23.9	−1388	−3491
0.001560	0.133	3.4	−4314	−6258
0.002055	0.211	3.9	−7580	−9349
Starting amount: $n_{Ag_{0.5}Ga_{0.5}} = 0.017161$ mol ($T = 1073$ K)				
0.001400	0.075	15.2	−2383	−4456
0.001906	0.162	−20.5	−7114	−8993
0.002171	0.242	0.2	−10489	−12189
0.002205	0.309	−7.3	−13617	−15166
0.002528	0.373	−79.4	−19178	−20853
0.002639	0.428	−127.9	−25483	−26765
Starting amount: $n_{Ag_{0.5}Ga_{0.5}} = 0.023972$ mol ($T = 1173$ K)				
0.001120	0.045	34.4	−606	−2516
0.001611	0.102	25.5	−2289	−4084
0.001870	0.161	15.7	−4491	−6169
0.002074	0.218	16.3	−6657	−8221
0.002357	0.274	−2.4	−9420	−10873
0.003048	0.335	−29.4	−13188	−14518
0.003292	0.391	−77.4	−17762	−18980
0.003093	0.435	−87.7	−21765	−22895
0.002560	0.467	−75.2	−24720	−25785
0.002509	0.495	−9.9	−25964	−26973
Starting amount: $n_{Ag_{0.5}Ga_{0.5}} = 0.019106$ mol ($T = 1173$ K)				
0.001253	0.062	37.6	−884	−2760
0.001579	0.129	17.2	−3229	−4970
0.001764	0.194	8.6	−5927	−7539
0.002170	0.262	8.5	−8821	−10297
0.002329	0.323	−25.3	−12650	−14004
0.002658	0.381	−97.1	−18526	−19763
0.002772	0.432	−75.9	−22909	−24045
0.002574	0.472	−32.4	−25328	−26383
0.001895	0.499	21.1	−25719	−26722
0.001237	0.514	34.2	−25435	−26406
Starting amount: $n_{Ag_{0.6}Ga_{0.4}} = 0.020459$ mol ($T = 1173$ K)				
0.000946	0.044	38.9	−141	−3084
0.001082	0.090	15.4	−1585	−4385

Table 4 (*Continued*)

Added amount, n_{Te} (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
0.001737	0.155	16.8	−3956	−6556
0.001962	0.219	21.8	−6151	−8556
0.002386	0.284	16.2	−8774	−10978
0.002690	0.346	−44.4	−13253	−15267
0.002690	0.397	−61.0	−17513	−19368
0.002843	0.444	−61.7	−21264	−22975
0.003363	0.491	10.8	−22928	−24496
0.002386	0.519	82.4	−22192	−23673
Starting amount: $n_{Ag_{0.6}Ga_{0.4}} = 0.019942$ mol ($T = 1173$ K)				
0.001080	0.051	41.2	−320	−3240
0.001424	0.112	11.8	−2589	−5323
0.001877	0.180	19.9	−4991	−7515
0.002005	0.243	17.8	−7311	−9643
0.002103	0.299	−14.1	−10546	−12705
0.002226	0.350	−61.7	−15011	−17014
0.002266	0.394	−54.7	−18691	−20556
0.002003	0.429	−40.3	−21317	−23075
0.001991	0.460	−22.0	−23155	−24818
0.001570	0.482	28.6	−23277	−24872
0.001724	0.504	62.8	−22618	−24145

Added amount, $n_{Ag_{0.2}Ga_{0.8}}$ (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
Starting amount: $n_{Te} = 0.015835$ mol ($T = 1173$ K)				
0.001800	0.898	−96.6	−9194	−9191
0.002390	0.791	−135.2	−19197	−19189
0.002424	0.705	−120.6	−26425	−26415
Starting amount: $n_{Te} = 0.018225$ mol ($T = 1173$ K)				
0.002165	0.894	−76.2	−7604	−7600
0.002356	0.801	−116.3	−15698	−15691
0.002648	0.718	−173.1	−24675	−24665

Added amount, $n_{Ag_{0.4}Ga_{0.6}}$ (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
Starting amount: $n_{Te} = 0.016859$ mol ($T = 1173$ K)				
0.001289	0.929	−26.0	−3714	−3789
0.001558	0.856	−29.5	−7458	−7611
0.001952	0.778	−49.2	−11953	−12188
0.001918	0.715	−53.1	−15846	−16149
0.002153	0.655	−63.6	−19680	−20046
0.002286	0.602	−55.6	−22677	−23100
0.002401	0.554	−20.8	−24105	−24578
Starting amount: $n_{Te} = 0.017574$ mol ($T = 1173$ K)				
0.001154	0.938	−28.2	−3483	−3548
0.001430	0.872	−35.4	−7269	−7405
0.001711	0.804	−49.1	−11459	−11668
0.001835	0.741	−48.4	−15101	−15376
0.002131	0.680	−78.4	−19540	−19880
0.003025	0.609	−85.5	−23821	−24236
0.003047	0.551	−14.1	−25053	−25530

Table 4 (*Continued*)

Added amount, $n_{Ag_{0.5}Ga_{0.5}}$ (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
Starting amount: $n_{Te} = 0.017049$ mol ($T = 1073$ K)				
0.001822	0.903	−25.0	−4287	−4503
0.001833	0.823	−35.9	−8359	−8755
0.002539	0.734	−79.3	−14210	−14807
0.002796	0.655	−117.7	−20498	−21272
0.003018	0.587	−104.9	−25164	−26091
0.003215	0.528	−54.4	−27401	−28458
Starting amount: $n_{Te} = 0.016538$ mol ($T = 1073$ K)				
0.001314	0.926	−26.8	−3761	−3926
0.001935	0.836	−43.1	−8574	−8942
0.002296	0.749	−64.3	−13783	−14346
0.002585	0.670	−93.2	−19332	−20071
0.003328	0.591	−120.4	−24981	−25899
0.002872	0.536	−75.7	−27964	−29005
0.002153	0.501	14.5	−27703	−28822
Starting amount: $n_{Te} = 0.015743$ mol ($T = 1173$ K)				
0.001234	0.927	−10.3	−3174	−3320
0.001535	0.850	−19.7	−6907	−7206
0.002230	0.759	−44.1	−12092	−12574
0.002832	0.668	−68.5	−17791	−18455
0.003007	0.592	−52.9	−21767	−22582
Starting amount: $n_{Te} = 0.014386$ mol ($T = 1173$ K)				
0.001350	0.914	−29.3	−4897	−5068
0.001738	0.823	−27.9	−9523	−9876
0.002218	0.731	−52.4	−15093	−15631
0.002394	0.651	−51.3	−19610	−20307
0.002814	0.578	−43.8	−23147	−23991

Added amount, $n_{Ag_{0.6}Ga_{0.4}}$ (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
Starting amount: $n_{Te} = 0.019353$ mol ($T = 1173$ K)				
0.001105	0.946	−13.2	−2634	−2800
0.001451	0.883	−9.6	−5334	−5693
0.001850	0.815	−13.8	−8363	−8934
0.002144	0.747	−23.0	−11605	−12383
0.002921	0.671	−53.3	−16008	−17020
0.003139	0.605	−47.9	−19550	−20764
0.002256	0.566	−33.7	−21673	−23010
0.002129	0.532	−22.5	−23178	−24618
0.002092	0.503	16.1	−23502	−25030
Starting amount: $n_{Te} = 0.016491$ mol ($T = 1173$ K)				
0.001488	0.917	−11.1	−3661	−3916
0.001598	0.842	−10.1	−6885	−7370
0.001871	0.769	−15.1	−10198	−10910
0.002246	0.696	−29.7	−13972	−14908
0.002680	0.625	−30.7	−17454	−18608
0.002663	0.568	−27.2	−20167	−21497

Table 5
Heat of solution ΔQ, experimental excess enthalpies $H^{E}_{Ag_yIn_{1-y}-Te}$ and ternary excess enthalpies $H^{E}_{Ag-In-Te}$ according to the reactions (1) and (2) along the section Ag_yIn_{1-y}–Te

Added amount, n_{Te} (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^{E}, H^{E}_{exp} (J/mol)	Ternary, H^{E} (J/mol)
Starting amount: $n_{Ag_{0.2}In_{0.8}} = 0.020686$ mol ($T = 1173$ K)				
0.001213	0.055	2.4	−2348	−3417
0.001581	0.119	−6.2	−5438	−6435
0.002001	0.188	−22.8	−9389	−10308
0.002621	0.264	−50.8	−14455	−15288
0.002947	0.334	−82.3	−19943	−20698
0.003418	0.400	−44.0	−23640	−24320
0.003853	0.460	8.0	−25514	−26125
0.004332	0.515	79.3	−25565	−26144
Starting amount: $n_{Ag_{0.2}In_{0.8}} = 0.016505$ mol ($T = 1173$ K)				
0.000944	0.054	2.9	−2233	−3304
0.001625	0.135	−6.7	−6175	−7154
0.002056	0.219	−24.9	−11069	−11953
0.002687	0.307	−57.7	−17248	−18032
0.003195	0.389	−55.4	−22503	−23195
0.003652	0.462	−1.3	−25146	−25756
0.003662	0.519	51.9	−25683	−26227
0.004096	0.570	107.5	−24874	−25360
Starting amount: $n_{Ag_{0.4}In_{0.6}} = 0.019129$ mol ($T = 1173$ K)				
0.001149	0.057	14.1	−1817	−4563
0.001659	0.128	4.8	−4812	−7351
0.002305	0.211	−11.6	−9048	−11345
0.002952	0.297	−50.3	−14730	−16777
0.003286	0.372	−53.9	−19691	−21518
0.003468	0.437	6.5	−22017	−23657
0.003783	0.493	70.4	−22390	−23866
Starting amount: $n_{Ag_{0.4}In_{0.6}} = 0.017545$ mol ($T = 1173$ K)				
0.000867	0.047	12.5	−1407	−4181
0.001463	0.117	9.7	−4079	−6649
0.001975	0.197	−9.0	−8128	−10466
0.002592	0.282	−48.3	−13943	−16033
0.003100	0.363	−73.9	−20048	−21902
0.003397	0.433	−4.5	−22859	−24510
Starting amount: $n_{Ag_{0.4}In_{0.6}} = 0.016757$ mol ($T = 1173$ K)				
0.001045	0.059	13.3	−1855	−4595
0.001343	0.125	4.4	−4607	−7155
0.001977	0.207	−7.4	−8675	−10985
0.002161	0.280	−36.7	−13560	−15655
0.002307	0.345	−48.1	−18214	−20120
0.001603	0.384	−19.7	−20478	−22272
0.001301	0.412	−3.0	−21672	−23384
0.001097	0.434	2.4	−22430	−24079
0.001426	0.460	12.1	−23047	−24619
0.001345	0.482	23.3	−23210	−24718
0.001755	0.509	45.4	−22967	−24397
Starting amount: $n_{Ag_{0.5}In_{0.5}} = 0.018142$ mol ($T = 973$ K)				
0.000974	0.051	−3.0	−2186	−6313
0.001195	0.107	−9.9	−4886	−8771
0.001598	0.172	−21.3	−8406	−12007

Table 5 (*Continued*)

Added amount, n_{Te} (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary, H^E (J/mol)
0.001838	0.236	−14.4	−11441	−14763
0.002013	0.296	−18.6	−14379	−17442
0.002190	0.351	−66.8	−18762	−21584
0.002096	0.396	−57.3	−22137	−24763
Starting amount: $n_{Ag_{0.5}In_{0.5}} = 0.012749$ mol ($T = 973$ K)				
0.000853	0.063	−3.5	−2750	−6826
0.001087	0.132	−14.9	−6504	−10279
0.001131	0.194	−14.0	−9771	−13275
0.001554	0.266	−14.6	−13299	−16490
0.001842	0.337	−29.0	−17353	−20238
0.002252	0.406	−66.3	−22799	−25381
Starting amount: $n_{Ag_{0.5}In_{0.5}} = 0.019376$ mol (T = 1073 K)				
0.000919	0.045	10.0	−1430	−5349
0.001258	0.101	−17.1	−4616	−8307
Starting amount: $n_{Ag_{0.5}In_{0.5}} = 0.015885$ mol ($T = 1073$ K)				
0.000962	0.057	16.9	−1421	−5292
0.001417	0.130	−12.3	−5278	−8849
0.001545	0.198	−6.4	−8500	−11793
0.001826	0.266	−5.1	−11600	−14614
0.002116	0.331	−47.2	−16334	−19080
0.002491	0.395	−46.1	−20566	−23051
0.002983	0.456	−21.0	−23515	−25747
Starting amount: $n_{Ag_{0.5}In_{0.5}} = 0.019024$ mol (T = 1173 K)				
0.001060	0.053	22.0	−1242	−4930
0.001457	0.117	14.2	−3497	−6935
0.001876	0.188	−0.5	−6790	−9953
0.002207	0.258	−16.1	−10652	−13543
0.002720	0.329	−57.0	−15896	−18509
0.003324	0.399	−23.5	−19626	−21695
0.003374	0.457	35.3	−20999	−23113
0.003608	0.508	112.7	−20263	−22180
Starting amount: $n_{Ag_{0.5}In_{0.5}} = 0.015930$ mol ($T = 1173$ K)				
0.001016	0.060	19.4	−1513	−5173
0.001430	0.133	9.3	−4339	−7715
0.001861	0.213	−3.4	−8186	−11251
0.002360	0.295	−33.7	−13452	−16196
0.002677	0.370	−37.8	−18219	−20673
0.003139	0.439	15.0	−20579	−22761
0.003125	0.495	83.8	−20275	−22242
Starting amount: $n_{Ag_{0.6}In_{0.4}} = 0.017521$ mol ($T = 1173$ K)				
0.001089	0.059	17.8	−1640	−5951
0.001480	0.128	5.4	−4518	−8512
0.001748	0.198	4.7	−7489	−11163
0.002101	0.268	−19.3	−11529	−14881
0.002371	0.334	−78.2	−17458	−20508
Starting amount: $n_{Ag_{0.6}In_{0.4}} = 0.014145$ mol ($T = 1173$ K)				
0.001219	0.079	26.6	−1784	−6000
0.001645	0.168	6.2	−5537	−9345
0.002002	0.256	−12.7	−10290	−13697
0.002433	0.340	−45.8	−16290	−19311

Table 5 (*Continued*)

Added amount, n_{Te} (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary, H^E (J/mol)
0.003006	0.421	3.7	−19589	−22238
0.003079	0.486	96.0	−18869	−21222
Starting amount: $n_{Ag_{0.6}In_{0.4}} = 0.017701$ mol ($T = 1173$ K)				
0.001153	0.061	33.8	−917	−5217
0.001372	0.125	8.0	−3467	−7474
0.001950	0.202	−17.9	−7869	−11525
0.002056	0.270	−15.5	−11602	−14948
0.002642	0.341	−63.3	−17177	−20193
0.001114	0.368	−14.1	−18763	−21659
Starting amount: $n_{Ag_{0.8}In_{0.2}} = 0.017064$ mol ($T = 1173$ K)				
0.001152	0.063	34.5	−910	−4416
0.001491	0.134	17.8	−3293	−6534
0.001875	0.209	1.9	−6770	−9729
0.002137	0.281	−21.9	−11077	−13769
0.002408	0.347	−56.4	−16301	−18746
0.002672	0.407	45.1	−17339	−19556
0.002846	0.461	104.1	−16477	−18495
Starting amount: $n_{Ag_{0.8}In_{0.2}} = 0.014424$ mol ($T = 1173$ K)				
0.001038	0.067	30.1	−1030	−4522
0.001496	0.149	13.4	−4063	−7247
0.001832	0.232	1.6	−7904	−10777
0.002001	0.306	−30.4	−12871	−15467
0.002346	0.377	−1.1	−16110	−18443

Added amount, $n_{Ag_{0.2}In_{0.8}}$ (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
Starting amount: $n_{Te} = 0.019085$ mol ($T = 1173$ K)				
0.001064	0.947	−29.2	−3123	−3183
0.001548	0.880	−44.8	−7229	−7366
0.002211	0.798	−79.9	−12838	−13066
0.002707	0.717	−91.8	−18207	−18528
0.003495	0.634	−119.8	−23754	−24169
0.003654	0.565	−68.0	−26630	−27123
Starting amount: $n_{Te} = 0.013447$ mol ($T = 1173$ K)				
0.001181	0.919	−36.8	−5075	−5166
0.001203	0.849	−32.9	−9176	−9347
0.002180	0.747	−76.3	−16140	−16427
0.003043	0.639	−88.7	−22607	−23016

Added amount, $n_{Ag_{0.4}In_{0.6}}$ (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
Starting amount: $n_{Te} = 0.014101$ mol ($T = 1173$ K)				
0.001157	0.924	−18.5	−3926	−4146
0.001567	0.838	−28.5	−8584	−9056
0.002222	0.740	−39.8	−13844	−14600
0.002604	0.651	−48.0	−18699	−19715
0.003569	0.559	−4.9	−21310	−22593
Starting amount: $n_{Te} = 0.017084$ mol ($T = 1173$ K)				
0.001627	0.913	−22.4	−4308	−4561
0.001650	0.839	−32.1	−8432	−8900

Table 5 (*Continued*)

Added amount, $n_{Ag_{0.4}In_{0.6}}$ (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
0.002222	0.756	−36.9	−12756	−13465
0.002605	0.678	−47.1	−17006	−17942
0.003405	0.597	−50.0	−20989	−22161
0.002985	0.541	−6.9	−22603	−23940
0.003535	0.487	52.8	−22426	−23921
Added amount, $n_{Ag_{0.5}In_{0.5}}$ (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
Starting amount: $n_{Te} = 0.014616$ mol ($T = 973$ K)				
0.000922	0.941	−9.1	−2170	−2428
0.001591	0.853	−27.6	−6059	−6697
0.002038	0.763	−59.4	−11355	−12387
0.002280	0.682	−74.2	−16446	−17831
0.002668	0.606	−85.9	−21144	−22857
0.003192	0.535	−84.2	−24879	−26900
0.001494	0.508	−1.6	−25030	−27171
Starting amount: $n_{Te} = 0.012398$ mol ($T = 973$ K)				
0.001619	0.884	−20.1	−4517	−5019
0.001759	0.786	−36.0	−9271	−10202
0.001864	0.703	−49.7	−13928	−15220
0.002354	0.620	−76.3	−19249	−20901
0.002828	0.543	−94.9	−24332	−26319
Starting amount: $n_{Te} = 0.014917$ mol ($T = 1073$ K)				
0.001115	0.930	−16.6	−3324	−3609
0.001365	0.857	−18.2	−6690	−7275
0.001929	0.772	−27.1	−10710	−11646
0.002228	0.692	−39.7	−14846	−16110
0.002442	0.622	−51.8	−18840	−20394
0.002627	0.560	−50.1	−22109	−23915
0.002158	0.518	−11.3	−23312	−25289
0.001483	0.493	15.0	−23285	−25367
Starting amount: $n_{Te} = 0.013844$ mol ($T = 1073$ K)				
0.001010	0.932	−10.9	−2974	−3253
0.001475	0.848	−19.9	−6897	−7522
0.001780	0.764	−22.4	−10693	−11660
0.001883	0.692	−30.9	−14328	−15591
0.002450	0.617	−42.1	−18232	−19805
0.002604	0.553	−41.1	−21396	−23232
0.001537	0.521	−6.8	−22315	−24283
0.001308	0.496	11.0	−22416	−24484
Starting amount: $n_{Te} = 0.016085$ mol ($T = 1173$ K)				
0.001089	0.937	−4.7	−2484	−2731
0.001599	0.857	−9.0	−5722	−6280
0.001959	0.776	−11.1	−9012	−9885
0.002539	0.691	−33.3	−13266	−14468
0.003035	0.611	−41.0	−17316	−18829
0.003347	0.542	−17.3	−19881	−21663
0.003430	0.486	51.7	−19873	−21874
Starting amount: $n_{Te} = 0.016768$ mol ($T = 1173$ K)				
0.001282	0.929	−18.4	−3495	−3771

Table 5 (*Continued*)

Added amount, $n_{Ag_{0.5}In_{0.5}}$ (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
0.001684	0.850	−15.8	−6972	−7557
0.002057	0.770	−21.7	−10602	−11500
0.002536	0.689	−26.7	−14231	−15440
0.003028	0.613	−33.6	−17743	−19250
0.003197	0.549	−10.7	−19886	−21643
0.003115	0.498	26.8	−20478	−22432
Added amount, $n_{Ag_{0.6}In_{0.4}}$ (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
Starting amount: $n_{Te} = 0.015346$ mol ($T = 1173$ K)				
0.000918	0.944	−6.3	−2791	−3050
0.001368	0.870	1.1	−5815	−6409
0.002034	0.780	1.9	−9514	−10520
0.002271	0.700	2.9	−12799	−14175
0.002482	0.628	−7.2	−16115	−17816
0.002963	0.560	−6.0	−19192	−21205
Starting amount: $n_{Te} = 0.016888$ mol ($T = 1173$ K)				
0.001334	0.927	−0.5	−3141	−3477
0.001986	0.836	1.5	−6940	−7692
0.002334	0.749	2.4	−10521	−11670
0.002874	0.664	−5.3	−14351	−15887
0.003290	0.588	−10.0	−17929	−19814
0.002007	0.550	4.4	−19394	−21455
Added amount, $n_{Ag_{0.8}In_{0.2}}$ (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
Starting amount: $n_{Te} = 0.018568$ mol ($T = 1173$ K)				
0.001357	0.932	10.1	−2052	−2307
0.001684	0.859	15.7	−4090	−4617
0.001738	0.795	17.4	−5836	−6602
0.002077	0.730	16.9	−7762	−8771
0.002543	0.664	21.3	−9707	−10965
0.002785	0.604	13.3	−11798	−13281
0.003211	0.547	15.5	−13776	−15473
0.003287	0.498	17.3	−15411	−17288
0.003642	0.454	37.2	−16473	−18516
0.003724	0.416	81.8	−16398	−18584
Starting amount: $n_{Te} = 0.014430$ mol ($T = 1173$ K)				
0.001434	0.910	6.5	−2985	−3323
0.001874	0.814	12.4	−5937	−6635
0.002013	0.731	10.7	−8615	−9623
0.002115	0.660	10.8	−10920	−12193
0.002688	0.588	10.7	−13401	−14944
0.002863	0.526	10.6	−15537	−17310
0.002890	0.476	18.5	−17025	−18986
0.003031	0.433	48.0	−17453	−19575
Starting amount: $n_{Te} = 0.017417$ mol ($T = 1173$ K)				
0.001074	0.942	5.9	−1860	−2087
0.001498	0.871	12.3	−3923	−4404
0.002122	0.788	10.2	−6689	−7484

Table 5 (*Continued*)

Added amount, $n_{Ag_{0.8}In_{0.2}}$ (mol)	Mole fraction, x_{Te}	Heat effect, ΔQ (J)	Experimental H^E, H^E_{exp} (J/mol)	Ternary H^E, H^E (J/mol)
0.002331	0.713	29.1	−8444	−9520
0.002488	0.647	13.5	−10632	−11954
0.002874	0.584	16.0	−12690	−14245
0.002673	0.536	11.7	−14377	−16112
0.002345	0.500	10.0	−15650	−17521
0.002256	0.470	26.6	−16265	−18250
0.002940	0.435	35.7	−16937	−19051
0.002144	0.413	40.8	−17017	−19214

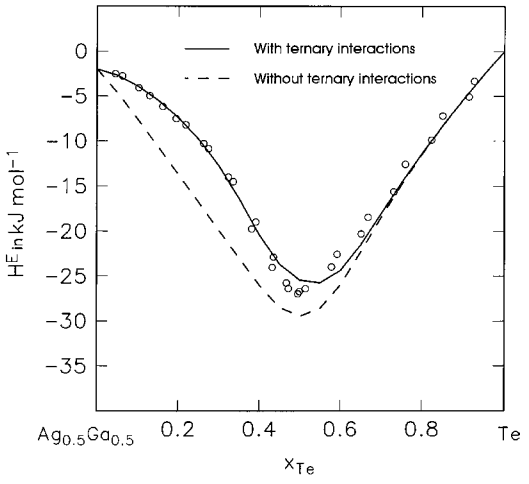

Fig. 6. Experimental points and calculated excess enthalpies of the section $Ag_{0.5}Ga_{0.5}$–Te at 1173 K.

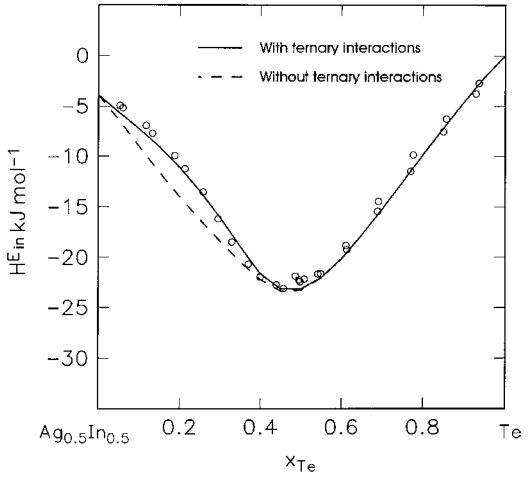

Fig. 7. Experimental points and calculated excess enthalpies of the section $Ag_{0.5}In_{0.5}$–Te at 1173 K.

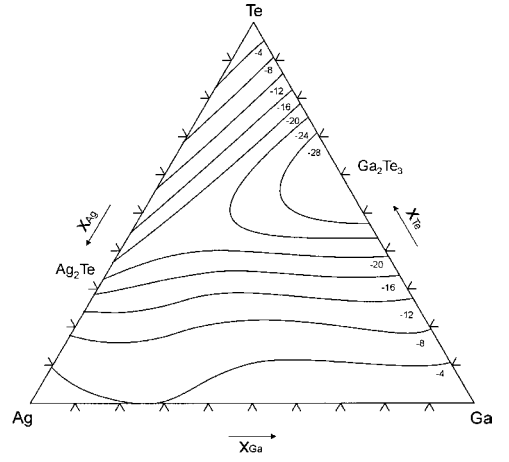

Fig. 8. Isoenthalpics of the system Ag–Ga–Te at 1173 K projected onto the Gibbs triangle.

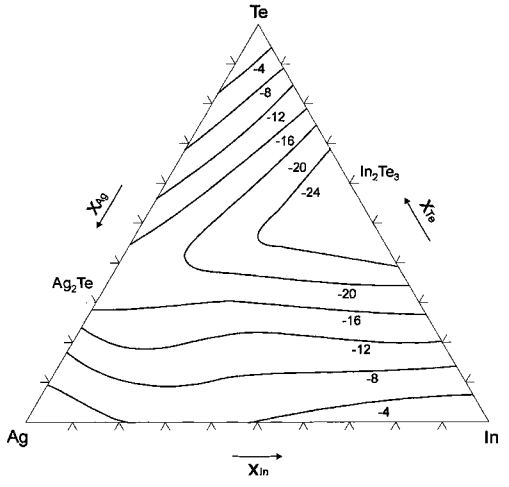

Fig. 9. Isoenthalpics of the system Ag–In–Te at 1173 K projected onto the Gibbs triangle.

Table 6
Ternary interaction parameters of the association model (in kJ mol^{-1})

System	$C^H_{Ag_2Te,M}$	$C^H_{M_2Te_3,Ag}$	$C^H_{Ag_2Te,M_2Te_3}$	$C^H_{Ag_3M,M_2Te_3}$
Ag–Ga–Te	28.1	134.4	47.3	302.9
Ag–In–Te	5.7	110.6	4.9	199.1

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