saturation line; T, temperature, p, pressure; ρ, density; p_{cr}, ρ_{cr}, T_{cr}, critical parameters; $\omega = \rho/\rho_{cr}$, reduced density; $\tau = T/T_{cr}$, reduced temperature.

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CALCULATION OF THE THERMODYNAMIC CHARACTERISTICS OF THE SYSTEMS Li—LiH, Li—LiD, AND Li—LiT

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An analysis and generalization of experimental literature data are made on the basis of the properties of the behavior of a system of the Li—LiH type with liquid—vapor equilibrium which were discussed earlier.

The behavior of a system of the Li—LiH type under conditions of liquid—vapor phase equilibrium at a constant temperature was discussed in [1]. The liquid phase consisted of a real solution of Li and LiH while the vapor phase consisted of an ideal-gas mixture of Li, LiH, H_2, Li_2, and Li_2H.

A series of equations were obtained for calculating the thermodynamic properties of such systems in the presence of the heterogeneous reaction

$$\mathrm{LiH}_{(l)} \rightleftarrows \mathrm{Li}_{(l)} + 1/2\mathrm{H}_2\,(\mathrm{g}) \tag{1}$$

In particular, the following equations were obtained for the activity coefficients of the components of the liquid phase, neglecting the influence of the pressure on the properties of the liquid (for T = const, x < 1):

for lithium

$$\ln\gamma_1 = -xF + \int_0^x F dx, \tag{2}$$

for lithium hydride

$$\ln\gamma_2 = (1-x)F + \int_0^x F dx - \ln K. \tag{3}$$

Here x is the molar fraction of lithium hydride in the liquid solution; $F = \ln\left(\frac{1-x}{x} p_3^{1/2}\right)$; K is the equilibrium constant of the reaction (1), a function of the temperature,

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$$K = \frac{(1-x)\gamma_1}{x\gamma_2} P_3^{1/2}, \qquad (4)$$

where P_3 is the hydrogen partial pressure.

In [1] it was also found, on the basis of thermodynamic considerations, that

$$\lim_{x \to 0} F = \ln C, \qquad (5)$$

where C is the so-called Siverts constant, and it was shown on the basis of experimental data (of [2, 3], in particular) that a limit

$$\lim_{x \to 1} F = \ln H \qquad (6)$$

exists in systems of the type under consideration as $x \to 1$ (or at least as $x \to (1-\varepsilon)$, where $\varepsilon \ll 1$). Under these conditions from Eq. (4) with T = const, using the Gibbs–Duhem equation, it is easy to obtain

$$\ln \gamma_1 = -xF - \int_x^1 F dx + \ln K \qquad (7)$$

and

$$\ln \gamma_2 = (1-x)F - \int_x^1 F dx. \qquad (8)$$

In the present report literature data are analyzed on the basis of equations obtained earlier and concrete calculations are made for a series of thermodynamic characteristics of the Li–LiH, Li–LiD, and Li–LiT systems.

These systems are distinguished by the existence of an immiscibility zone in the liquid phase. Therefore, in a study, for example, of the dependence of the activity coefficients of the components on the composition at a constant temperature it is desirable to divide the interval of concentrations $0 \leqslant x \leqslant 1$ into three sections: a left section ($0 \leqslant x < x'$), an immiscibility zone ($x' \leqslant x \leqslant x''$), and a right section ($x'' < x \leqslant 1$); here x' and x'' are the left and right boundaries, respectively, of the immiscibility zone, whose positions are assumed to be known from experiment.

In [2-5] extensive experimental material has been obtained on the dependence of the partial pressure of hydrogen and deuterium on the composition of the liquid phase in the Li–LiH and Li–LiD systems. The authors' treatment of their own data led to very complicated functions and yet do not satisfy certain limiting thermodynamic equations, as was noted in [1].

A mathematical treatment by the method of least squares which was made of the experimental data of [2, 3] on the function $P_3 = f(x)$ showed that for both the Li–LiH and the Li–LiD systems the data at T = const are described best, with a scatter in the range of ±(1-2)%, by the equation

$$F = \ln C + bx^{1,2} + dx^{2,4} \qquad (9)$$

in the left section and

$$F = \ln H + B(1-x)^{1,2} \qquad (10)$$

in the right section.

The results of the treatment are summarized in Table 1 and are presented in Figs. 1-5,

It is seen from Figs. 1-3 that the quality of the experiment in the Li–LiD system is somewhat inferior to the quality of the experiment in the Li–LiH system, which is fully explainable by the increasing difficulties in working with the Li–LiD system.

For the left section of concentrations ($0 \leqslant x < x'$) we have, from Eqs. (2) and (3) with allowance for (9),

TABLE 1. Coefficients of the Function $F(x, P_{H_2})$ fromEqs. (9) and (10)

t, °C	C, torr $^{1/2}$	H, torr$^{1/2}$	b	d	B
			Li — LiH		
710	33,44	0,0794	—2,360	—4,020	38,52
759	44,55	0,1840	—2,320	—2,493	31,52
803	58,40	0,3366	—2,376	—2,285	25,28
847	73,40	0,6353	—2,355	—1,762	19,14
878	86,27	1,1106	—2,522	—1,068	13,03
903	95,75	1,7611	—2,487	—1,105	9,20
			Li — LiD		
705	40,45	0,0996	—2,194	—5,398	37,73
756	52,52	0,1738	—1,726	—5,918	43,00
805	72,61	0,3789	—2,692	—1,630	28,66
840	86,84	0,6769	—3,182	—0,754	19,57
871	94,10	0,9930	—2,484	—0,951	16,18

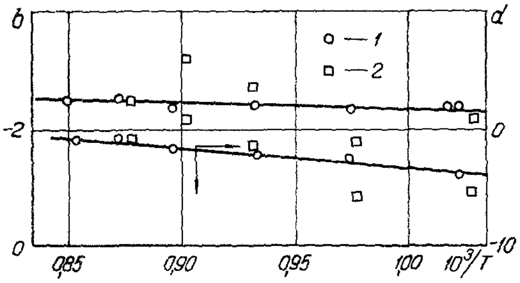

Fig. 1

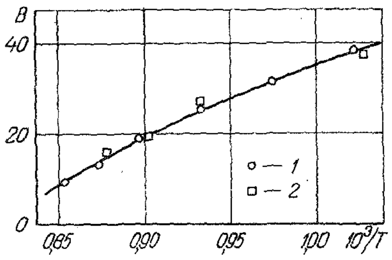

Fig. 2

Fig. 1. Temperature dependence of coefficients b and d (lines; Eq. (21)); 1) Li—LiH; 2) Li—LiD.

Fig. 2. Temperature dependence of the coefficient B (line: Eq. (22)); 1) Li—LiH; 2) Li—LiD.

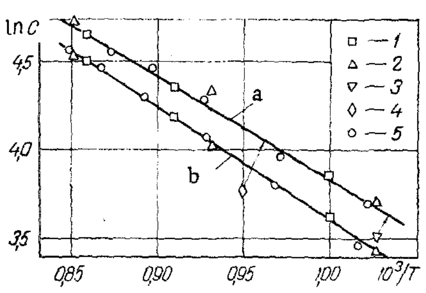

Fig. 3

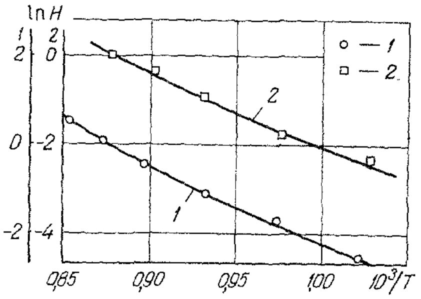

Fig. 4

Fig. 3. Temperature dependence of Siverts constant based on data of; 1) Veleckis [5]; 2) Smith [6]; 3) Goodal [16]; 4) Ihle and Wu [10]; 5) present work; a) Li—LiD; b) Li—LiH.

Fig. 4. Temperature dependence of the constant H: 1) Li—LiH; 2) Li—LiD.

$$\ln \gamma_1 = -0.5455bx^{2.2} - 0.706dx^{3.4}; \tag{11}$$

$$\ln \gamma_2 = bx^{1.2} - 0.5455bx^{2.2} + dx^{2.4} - 0.706dx^{3.4} + \ln \dot{\gamma}_2, \tag{12}$$

where (see [1])

$$\dot{\gamma}_2 = \lim_{x \to 0} \gamma_2 = C/K. \tag{13}$$

In the immiscibility zone ($x' \leq x \leq x''$) we have, from general thermodynamic considerations,

$$\ln\gamma_1 = \ln\gamma_1' + \ln\frac{1-x'}{1-x} = \ln\gamma_1'' + \ln\frac{1-x''}{1-x} \tag{14}$$

and

$$\ln\gamma_2 = \ln\gamma_2' + \ln\frac{x'}{x} = \ln\gamma_2'' + \ln\frac{x''}{x}. \tag{15}$$

In the right section ($x'' < x \leq 1$) we obtain, from (7) and (8) with allowance for (10), the expressions

$$\ln\gamma_1 = \ln\dot{\gamma}_1 - Bx(1-x)^{1,2} - 0.4545B(1-x)^{2,2}; \tag{16}$$

$$\ln\gamma_2 = 0.5455B(1-x)^{2,2}. \tag{17}$$

Here (see [1])

$$\dot{\gamma}_1 = \lim_{x\to 1}\gamma_1 = K/H. \tag{18}$$

From Eqs. (11), (14), and (16), we can find $\dot{\gamma}_1$

$$\ln\dot{\gamma}_1 = \ln\frac{1-x'}{1-x''} - 0.5455\,bx'^{2,2} - 0.706\,dx'^{3,4} + Bx''(1-x'')^{1,2} + 0.4545\,B(1-x'')^{2,2}. \tag{19}$$

Proceeding similarly, from (12), (15), and (17), we obtain for $\dot{\gamma}_2$

$$\ln\dot{\gamma}_2 = \ln\frac{x''}{x'} + 0.5455\,B(1-x'')^{2,2} - bx'^{1,2} + 0.5455\,bx'^{2,2} - dx'^{2,4} + 0.706\,dx'^{3,4}. \tag{20}$$

From the values of $\dot{\gamma}_1$ and $\dot{\gamma}_2$ found, and the quantities C and H known from an independent treatment of the experimental data, we can obtain the value of the equilibrium constant K in two ways, using (13) and (18).

The results of the calculation, presented in Table 2, show satisfactory agreement (the values of x' and x'' were taken from the data of [4, 5]; K' is from (13) and K'' from (18)).

The temperature dependence of $\dot{\gamma}_1$ and $\dot{\gamma}_2$ for the Li–LiH and Li–LiD systems is presented in Fig. 5.

It is seen that within the limits of the scatter of the initial data no difference is observed between the activity coefficients $\dot{\gamma}_1$ in the Li–LiH and Li–LiD systems, as between $\dot{\gamma}_2$. This fact, as well as the experimental fact (see [4–6]) that the boundaries of the immiscibility zones for the Li–LiH and Li–LiD systems coincide, together with the similarity in the character of the concentration dependence of the activity coefficients of the components in these systems (see Eqs. (11), (12), (16), and (17)), permit one to conclude that the temperature and concentration dependences of the activity coefficients of the corresponding components in the Li–LiH and Li–LiD systems practically coincide in the entire concentration range of $0 \leqslant x \leqslant 1$ within the limits of the experimental error.

The data of Tables 1 and 2 were treated by the method of least squares. The temperature dependence for the quantities b, d, ln, C, and ln K has the form

$$Y = \alpha + \beta/T. \tag{21}$$

The interpolation equation for B and ln H is represented in the form

$$Y = \alpha + \beta/T + \delta\ln T. \tag{22}$$

Considering the conclusion that the activity coefficients of the corresponding components in the Li–LiH and Li–LiD systems coincide, and the comment made above about the somewhat larger error of the data obtained in [3] for the Li–LiD system, only the data of [2] on the Li–LiH system were used in approximating the coefficients b, d, and B.

The values of K' and K'' were treated jointly for each of the systems (Li–LiH and Li–LiD). This makes it possible in principle to increase the accuracy of the equation obtained for the

TABLE 2. Values of $\ln \dot{\gamma}_1$, $\ln \dot{\gamma}_2$, and Equilibrium Constants of Reaction (1) in the Li–LiH and Li–LiD Systems

t, °C	$\ln\dot{\gamma}_1$	$\ln\dot{\gamma}_2$	K', torr$^{1/2}$	K'', torr$^{1/2}$
		Li — LiH		
710	4,200	1,874	5,13	5,29
759	3,753	1,765	7,63	7,85
803	3,461	1,714	10,52	10,72
847	3,129	1,632	14,35	14,52
878	2,773	1,587	17,65	17,78
903	2,453	1,543	20,47	20,47
		Li — LiD		
705	4,065	1,918	5,94	5,80
756	3,939	1,797	8,71	8,93
805	3,523	1,749	12,63	12,84
840	3,183	1,809	14,23	16,33
871	2,960	1,581	19,36	19,16

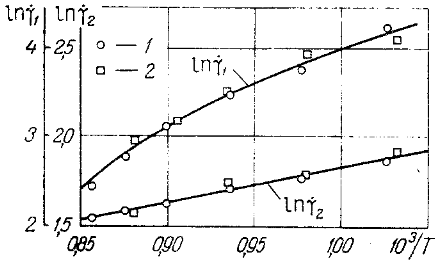

Fig. 5. Temperature dependence of $\dot{\gamma}_1$ and $\dot{\gamma}_2$ based on data of Table 2 (solid lines correspond to equations of Table 3): 1) Li–LiH; 2) Li–LiD.

equilibrium constant K, since more extensive experimental material is drawn upon, data on the boundaries of the immiscibility zone, as well as the experiment to the left and right of the immiscibility zone on the hydrogen and deuterium partial pressures.

The coefficients of Eqs. (21) and (22) are summarized in Table 3. For the activity coefficients $\dot{\gamma}_1$ and $\dot{\gamma}_2$ the equations for the temperature dependence were chosen in the form of (22) and (21), using (13) and (18) with the appropriate averaging of the coefficients. The agreement between the equations thus obtained and the initial data is illustrated in Fig. 5.

The relatively large scatter of the data in the approximation of the coefficient d is not important, since the corresponding terms of the equations containing this coefficient are an order of magnitude smaller than the other terms.

The literature data for the Li–LiH and Li–LiD systems, with which the results obtained in the present report show satisfactory agreement (except for that of [7], in which there are evidently a number of systematic errors), are also presented in Fig. 3.

The comparative analysis made of the behavior of the thermodynamic properties of Li–LiH and Li–LiD not only made it possible to obtain a simple system of calculating equations for determining the thermophysical characteristics of these systems, but also made it possible to find the analogous properties of the Li–LiT system, for which experimental or calculated data are practically absent from the literature. We can only name [7], which has a large error, and the research of Smith et al. [8], in which the results of a measurement of the Siverts constants in the Li–LiH, Li–LiD, and Li–LiT systems are presented, as well as the data of Veleckis [9] on a measurement of the tritium partial pressure above an Li–LiT solution in the immiscibility zone.

The equality of the activity coefficients of the corresponding components in the Li–LiH and Li–LiD systems and the coincidence of the boundaries of the immiscibility zones in them

TABLE 3. Parameters of Temperature Dependence of Thermodynamic Characteristics of Li—LiH and Li—LiD Systems

Coefficient	System	α	β	δ	Scatter, %
b		—3,281	952,4		3
d		14,396	—17875		15
B		4574	—459294	—590	3
$\ln\gamma_1$		416,45	—47325	—52,845	2,5
$\ln\gamma_2$		—0,131	1979		2,5
$\ln C$	Li — LiH	9,989	—6376		0,5
	Li — LiD	9,785	—5958		1
$\ln H$	Li — LiH	—342,453	30087	44,89	5
	Li — LiD	—470,399	48282	60,81	5
$\ln K$	Li — LiH	10,007	—8217		1
	Li — LiD	10,028	—8075		1

TABLE 4. Comparison of Equilibrium Constants, Sieverts Constants, and Plane Pressures in the Li—LiH and Li—LiD Systems

T, °K	$(P_{H_2}/P_{D_2})^{1/2}$	K_{LiH}/K_{LiD}	C_{LiH}/C_{LiD}	δ (K/P), %	δ (C/P), %
1000	0,835	0,850	0,791	1,7	—5,3
1100	0,856	0·861	0,823	0,6	—3,9
1200	0,875	0,870	0,849	—0,6	—3,1

permit us to assume that these facts will also be valid in the case of Li—LiT. Starting from this, on the basis of (4) we can obtain the equation (quantities for the Li—LiH system in the numerator and for Li—LiD in the denominator).

$$\ln \frac{C_{LiH}}{C_{LiD}} = \ln \frac{K_{LiH}}{K_{LiD}} = \frac{1}{2} \ln \frac{P_{H_2}}{P_{D_2}}. \tag{23}$$

If this equation is used for the boundary of the immiscibility zone then an interesting possibility appears, connected with the presence of independent measurements of the hydrogen, deuterium, and tritium partial pressures for the Li—LiH, Li—LiD, and Li—LiT systems, respectively, in the plane region. Having these data available (the information on the Li—LiH system must be considered as more reliable), from (23) we can obtain the values of the constant K and the Siverts constant C for the Li—LiT system.

The temperature dependence of the partial pressure of the hydrogen isotopes in the plane region of the systems under consideration above the monotectic temperature (according to the data of [9]) has the form (in Pascals)

$$\ln P_{H_2} = 21.34 - 17420/T, \tag{24}$$

$$\ln P_{D_2} = 21.15 - 16870/T, \tag{25}$$

$$\ln P_{T_2} = 20.92 - 16530/T. \tag{26}$$

A comparison of the values of $(P_{H_2}/P_{D_2})^{1/2}$, C_{LiH}/C_{LiD}, and K_{LiH}/K_{LiD} found from (24) and (25) and from Table 3 for the Li—LiH and Li—LiD systems is presented in Table 4. The fully satisfactory agreement is seen.

On the basis of the foregoing, using the available data on P_{H_2}, P_{D_2}, and P_{T_2} (Eqs. (24) and (26)) and on the equilibrium constant K and the Siverts constant for the Li—LiH and Li—LiD systems (see Table 3), we can obtain the following equations for Li—LiT:

$$\ln K = 9.797 - 7772/T, \tag{27}$$

$$\ln C = 9.670 - 5788/T. \tag{28}$$

The equations (27) and (28) obtained are important, since in all practical applications connected with the use of tritium and lithium tritide, knowledge of the quantities K and C

TABLE 5. Partial Pressures of Components and Total Vapor Pressure in the Li—LiH System

x	Li	LiH	H_2	Li_2	Li_2H	P
T = 800°K						
0,00001	1,076E+00	9,232E—07	7,56E—07	8,336E—03	4,934E—07	1,08404E+00
0,00005	1,076E+00	4,616E—06	1,89E—05	8,335E—03	2,467E—06	1,08402E+00
0,00010	1,076E+00	9,232E—06	7,56E—05	8,334E—03	4,933E—06	1,08403E+00
0,00050	1,075E+00	4,615E—05	1,89E—03	8,328E—03	2,465E—05	1,08546E+00
0,00100	1,075E+00	9,227E—05	7,57E—03	8,319E—03	4,926E—05	1,09066E+00
0,00500	1,070E+00	4,599E—04	1,90E—01	8,253E—03	2,446E—04	1,26884E+00
0,01000	1,065E+00	9,155E—04	7,59E—01	8,171E—03	4,844E—04	1,83311E+00
0,05000	1,024E+00	4,340E—03	1,85E+01	7,550E—03	2,207E—03	1,94880E+01
0,10000	9,773E—01	7,913E—03	6,73E+01	6,881E—03	3,842E—03	6,83011E+01
T = 1000						
0,00001	9,692E+01	2,155E—04	1,83E—05	2,359E+00	1,634E—04	9,92769E+01
0,00005	9,691E+01	1,077E—03	4,58E—04	2,359E+00	8,167E—04	9,92748E+01
0,00010	9,691E+01	2,154E—03	1,83E—03	2,358E+00	1,633E—03	9,92729E+01
0,00050	9,687E+01	1,077E—02	4,58E—02	2,357E+00	8,162E—03	9,92914E+01
0,00100	9,682E+01	2,153E—02	1,83E—01	2,354E+00	1,631E—02	9,93971E+01
0,00500	9,644E+01	1,073E—01	4,59E+00	2,335E+00	8,094E—02	1,03550E+02
0,01000	9,595E+01	2,135E—01	1,84E+01	2,312E+00	1,602E—01	1,16995E+02
0,05000	9,224E+01	1,010E+00	4,44E+02	2,137E+00	7,286E—01	5,40523E+02
0,10000	8,801E+01	1,851E+00	1,64E+03	1,945E+00	1,275E+00	1,73361E+03
0,15000	8,433E+01	2,511E+00	3,29E+03	1,786E+00	1,657E+00	3,37903E+03
0,20000	8,128E+01	2,996E+00	5,04E+03	1,659E+00	1,905E+00	5,12647E+03
0,25000	7,892E+01	3,320E+00	6,56E+03	1,564E+00	2,050E+00	6,65016E+03
0,25553	7,870E+01	3,347E+00	6,71E+03	1,555E+00	2,061E+00	6,79352E+03
0,98300	6,249E+00	2,984E—01	8,46E+03	9,807E—02	1,459E—02	8,46311E+03
0,98800	4,527E+00	2,783E—01	1,40E+04	5,145E—03	9,856E—03	1,40251E+04
0,99300	2,703E+00	2,610E—01	3,46E+04	1,834E—03	5,519E—03	3,46050E+04
0,99800	7,874E—01	2,472E—01	3,66E+05	1,557E—04	1,523E—03	3,65616E+05
T = 1200						
0,00001	1,988E+03	8,293E—03	1,54E—04	1,048E+02	8,175E—03	2,09276E+03
0,00005	1,988E+03	4,147E—02	3,84E—03	1,048E+02	4,087E—02	2,09274E+03
0,00010	1,988E+03	8,293E—02	1,54E—02	1,048E+02	8,174E—02	2,09272E+03
0,00050	1,987E+03	4,146E—01	3,84E—01	1,047E+02	4,085E—01	2,09287E+03
0,00100	1,986E+03	8,288E—01	1,54E+00	1,046E+02	8,162E—01	2,09374E+03
0,00500	1,978E+03	4,129E+00	3,84E+01	1,038E+02	4,050E+00	2,12841E+03
0,01000	1,968E+03	8,212E+00	1,54E+02	1,028E+02	8,015E+00	2,24069E+03
0,05000	1,892E+03	3,879E+01	3,71E+03	9,498E+01	3,639E+01	5,76875E+03
0,10000	1,805E+03	7,136E+01	1,38E+04	8,641E+01	6,387E+01	1,58177E+04
0,15000	1,726E+03	9,794E+01	2,84E+04	7,907E+01	8,385E+01	3,03768E+04
0,20000	1,657E+03	1,192E+02	4,57E+04	7,281E+01	9,793E+01	4,76259E+04
0,25000	1,595E+03	1,360E+02	6,41E+04	6,749E+01	1,076E+02	6,60235E+04
0,30000	1,541E+03	1,490E+02	8,25E+04	6,298E+01	1,139E+02	8,43947E+04
0,35000	1,493E+03	1,591E+02	1,00E+05	5,916E+01	1,178E+02	1,01954E+05
0,40000	1,452E+03	1,668E+02	1,16E+05	5,590E+01	1,201E+02	1,18293E+05
0,84000	4,823E+02	5,911E+01	1,32E+05	6,172E+00	1,414E+01	1,33026E+05
0,86000	4,535E+02	5,693E+01	1,39E+05	5,457E+00	1,280E+01	1,39480E+05
0,88000	4,156E+02	5,472E+01	1,53E+05	4,583E+00	1,128E+01	1,53360E+05
0,90000	3,685E+02	5,253E+01	1,79E+05	3,602E+00	9,599E+00	1,79711E+05
0,92000	3,122E+02	5,043E+01	2,30E+05	2,585E+00	7,807E+00	2,30533E+05
0,94000	2,468E+02	4,845E+01	3,40E+05	1,616E+00	5,930E+00	3,40180E+05
0,96000	1,726E+02	4,665E+01	6,44E+05	7,904E—01	3,933E+00	6,44446E+05
0,98000	9,001E+01	4,511E+01	2,22E+06	2,150E—01	2,014E+00	2,21538E+06

allows one to find a number of other thermodynamic characteristics about which direct information is absent; the partial pressure of tritium outside the immiscibility zone, the caloric properties of liquid LiT, etc.

In particular, we calculated the partial pressures of the components of the vapor phase in the state of phase equilibrium for the Li—LiH, Li—LiD, and Li—LiT systems under the assumption that the vapor phase is ideal. In doing this we allowed for the fact that, as experiment showed [10], in the region of low hydride concentrations, besides the dissociation reaction in the vapor phase (on the example of the Li—LiH system)

$$LiH \rightleftarrows Li + \frac{1}{2} H_2, \tag{29}$$

two other reactions prove important:

$$\mathrm{Li} \rightleftarrows \frac{1}{2}\,\mathrm{Li}_2 \qquad (30)$$

and

$$\mathrm{LiH} + \mathrm{Li}_2 \rightleftarrows \mathrm{Li}_2\mathrm{H} + \mathrm{Li}. \qquad (31)$$

Thus, five components are present in the gaseous phase: Li, LiH, H_2, Li_2, and Li_2H. The partial pressures of these components can be found from the following equations.

First of all, we write the expressions for the equilibrium constants of the chemical reactions (29)-(31) in the gaseous phase in the form

$$K_{P_1} = \frac{P_1 P_3^{1/2}}{P_2}; \qquad (32)$$

TABLE 6. Partial Pressures of Components and Total Vapor Pressure in the Li—LiD System

x	Li	LiT	T_2	Li_2	Li_2T	P
			$T = 800$°K			
0,00001	1,076E+00	8,376E—07	1,51E—06	8,336E—03	4,636E—07	1,08404E+00
0,00010	1,076E+00	8,375E—06	1,51E—04	8,334E—03	4,635E—06	1,08410E+00
0,00050	1,075E+00	4,187E—05	3,78E—03	8,328E—03	2,316E—05	1,08734E+00
0,00100	1,075E+00	8,371E—05	1,51E—02	8,319E—03	4,629E—05	1,09821E+00
0,00500	1,070E+00	4,175E—04	3,79E—01	8,253E—03	2,298E—04	1,45809E+00
0,01000	1,065E+00	8,306E—04	1,52E+00	8,171E—03	4,552E—04	2,59055E+00
0,05000	1,024E+00	3,938E—03	3,69E+01	7,550E—03	2,074E—03	3,79138E+01
0,10000	9,773E—01	7,179E—03	1,35E+02	6,881E—03	3,610E—03	1,35518E+02
			$T = 1000$			
0,00001	9,692E+01	1,917E—04	2,93E—05	2,359E+00	1,555E—04	9,92769E+01
0,00005	9,691E+01	9,586E—04	7,33E—04	2,359E+00	7,777E—04	9,92749E+01
0,00010	9,691E+01	1,917E—03	2,93E—03	2,358E+00	1,555E—03	9,92738E+01
0,00050	9,687E+01	9,584E—03	7,33E—02	2,357E+00	7,771E—03	9,93174E+01
0,00100	9,682E+01	1,916E—02	2,93E—01	2,354E+00	1,553E—02	9,95041E+01
0,00500	9,644E+01	9,547E—02	7,35E+00	2,335E+00	7,707E—02	1,06288E+02
0,01000	9,595E+01	1,899E—01	2,94E+01	2,312E+00	1,526E—01	1,27976E+02
0,10000	8,801E+01	1,647E+00	2,62E+03	1,945E+00	1,214E+00	2,71764E+03
0,15000	8,433E+01	2,235E+00	5,26E+03	1,786E+00	1,578E+00	5,35190E+03
0,10000	8,128E+01	2,666E+00	8,06E+03	1,659E+00	1,814E+00	8,14919E+03
0,25000	7,892E+01	2,954E+00	1,05E+04	1,564E+00	1,952Б+00	1,05882E+04
0,30000	7,732E+01	3,120E+00	1,22E+04	1,501E+00	1,019E+00	1,22831E+04
0,98300	6,249E+00	2,655E—01	1,35E+04	9,807E—03	1,389E—02	1,35369E+04
0,98800	4,527E+00	2,477E—01	2,24E+04	5,145E—03	9,384E—03	2,24371E+04
0,99300	2,703E+00	2,323E—01	5,54E+04	1,834E—03	5,255E—03	5,53659E+04
0,99800	7,784E—01	2,200E—01	5,85E+05	1,557E—04	1,450E—03	5,84983E+05
			$T = 1200$			
0,00001	1,988E+03	7,270E—03	2,12E—04	1,048E+02	7,668E—03	2,09275E+03
0,00005	1,988E+03	3,635E—02	5,29E—03	1,048E+02	3,834E—02	2,09273E+03
0,00010	1,988E+03	7,270E—02	2,12E—02	1,048E+02	7,668E—02	2,09271E+03
0,00050	1,987E+03	3,634E—01	5,30E—01	1,047E+02	3,831E—01	2,09294E+03
0,00100	1,986E+03	7,266E—01	2,12E+00	1,046E+02	7,656E—01	2,09417E+03
0,00500	1,978E+03	3,620E+00	5,30E+01	1,038E+02	3,799E+00	2,14223E+03
0,01000	1,968E+03	7,199E+00	2,12E+02	1,028E+02	7,518E+00	2,29744E+03
0,05000	1,892E+03	3,400E+01	5,11E+03	9,498E+01	3,414E+01	7,16804E+03
0,10000	1,805E+03	6,256E+01	1,90E+04	8,641E+01	5,991E+01	2,10377E+04
0,15000	1,726E+03	8,586E+01	3,92E+04	7,907E+01	7,865E+01	4,11313E+04
0,20000	1,657E+03	1,045E+02	6,30E+04	7,281E+01	9,186E+01	6,49370E+04
0,25000	1,595E+03	1,192E+02	8,84E+04	6,749E+01	1,009E+02	9,03276E+04
0,30000	1,541E+03	1,307E+02	1,14E+05	6,298E+01	1,068E+02	1,15682E+05
0,35000	1,493E+03	1,395E+02	1,38E+05	5,916E+01	1,105E+02	1,39917E+05
0,40000	1,452E+03	1,462E+02	1,61E+05	5,590E+01	1,126E+02	1,62468E+05
0,88000	4,156E+02	4,479E+01	2,11E+05	4,583E+00	1,058E+01	2,11357E+05
0,90000	3,685E+02	4,700E—01	2,26E+05	3,602E+00	9,004E+00	2,47727E+05
0,92000	3,122E+02	4,421E+01	3,17E+05	2,585E+00	7,323E+00	3,17856E+05
0,94000	2,468E+02	4,247E—01	4,69E+05	1,616E+00	5,562E+00	4,69133E+05
0,96000	1,726E+02	4,089E—01	8,89E+05	7,904E—01	3,745E+00	8,88876E+05
0,98000	9,001E+01	3,955E+05	3,06E+06	2,150E—01	1,889E+00	3,05590E+06

TABLE 7. Partial Pressures of Components and Total Vapor Pressure in the Li–LiT System

x	Li	LiD	D_2	Li_2	Li_2D	P
$T = 800$°K						
0,00001	1,076E+00	9,204E-07	1,43E-06	8,336E-03	5,095E-07	1,08404E+00
0,00005	1,076E+00	4,602E-06	3,57E-05	8,335E-03	2,547E-06	1,08403E+00
0,00010	1,076E+00	9,204E-06	1,43E-04	8,334E-03	5,094E-06	1,08409E+00
0,00050	1,075E+00	4,601E-05	3,58E-03	8,328E-03	2,545E-05	1,08715E+00
0,00100	1,075E+00	9,199E-05	1,43E-02	8,319E-03	5,087E-05	1,09741E+00
0,00500	1,070E+00	4,585E-04	3,58E-01	2,523E-03	2,525E-04	1,43770E+00
0,01000	1,065E+00	9,127E-04	1,43E+00	8,171E-03	5,002E-04	2,50882E+00
0,05000	1,024E+00	4,327E-03	3,49E+01	7,550E-03	2,279E-03	3,59235E+01
0,10000	9,773E-01	7,890E-03	1,27E+02	6,881E-03	3,968E-03	1,28256E+02
$T = 1000$						
0,00001	9,692E+01	2,044E-04	2,81E-05	2,359E+00	1,631E-04	9,92769E+01
0,00005	9,691E+01	1,022E-03	7,03E-04	2,359E+00	8,154E-04	9,92750E+01
0,00010	9,691E+01	2,044E-03	2,81E-03	2,358E+00	1,631E-03	9,92738E+01
0,00050	9,687E+01	1,022E-02	7,03E-02	2,357E+00	8,148E-03	9,93154E+01
0,00100	9,682E+01	2,043E-02	2,81E-01	2,354E+00	1,628E-02	9,94940E+01
0,00500	9,644E+01	1,018E-01	7,04E+00	2,335E+00	8,081E-02	1,05996E+02
0,01000	9,595E+01	2,025E-01	2,82E+01	2,312E+00	1,600E-01	1,26788E+02
0,05000	9,224E+01	9,578E-01	6,82E+02	2,137E+00	7,274E-01	7,77865E+03
0,10000	8,801E+01	1,756E+00	2,52E+03	1,945E+00	1,272E+00	2,60985E+02
0,15000	8,433E+01	2,382E+00	5,05E+03	1,786E+00	1,654E+00	5,13570E+03
0,20000	8,128E+01	2,842E+00	7,73E+03	1,659E+00	1,902E+00	7,81787E+03
0,25000	7,892E+01	3,149E+00	1,01E+04	1,564E+00	2,046E+00	1,01565E+04
0,25553	7,870E+01	3,175E+00	1,03E+04	1,555E+00	2,057E+00	1,03766E+04
0,98300	6,249E+00	2,849E-01	1,31E+04	9,807E-03	1,466E-02	1,31491E+04
0,98800	4,527E+00	2,657E-01	2,18E+04	5,145E-03	9,903E-03	2,17941E+04
0,99300	2,703E+00	2,492E-01	5,38E+04	1,834E-03	5,545E-03	5,37790E+04
0,99800	7,874E-01	2,360E-01	5,68E+05	1,557E-04	1,530E-03	5,68216E+05
$T = 1200$						
0,00001	1,988E+03	7,640E-03	2,05E-04	1,048E+02	8,059E-03	2,09275E+03
0,00005	1,988E+03	3,820E-02	5,12E-03	1,048E+02	4,029E-02	2,09273E+03
0,00010	1,988E+03	7,640E-02	2,05E-02	1,048E+02	8,058E-02	2,09272E+03
0,00050	1,987E+03	3,819E-01	5,12E-01	1,047E+02	4,026E-01	2,09296E+03
0,00100	1,986E+03	7,635E-01	2,05E+00	1,046E+02	8,046E-01	2,09418E+03
0,00500	1,978E+03	3,804E+00	5,13E+01	1,038E+02	3,992E+00	2,14089E+03
0,01000	1,968E+03	7,565E+00	2,05E+02	1,028E+02	7,900E+00	2,29132E+03
0,05000	1,892E+03	3,573E+01	4,95E+03	9,498E+01	3,587E+01	7,00554E+03
0,10000	1,805E+03	6,574E+01	1,84E+04	8,641E+01	6,296E+01	2,04264E+04
0,15000	1,726E+03	9,023E+01	3,79E+04	7,907E+01	8,265E+01	3,98684E+04
0,20000	1,657E+03	1,098E+02	6,10E+04	7,281E+01	9,654E+01	6,29016E+04
0,25000	1,595E+03	1,253E+02	8,56E+04	6,749E+01	1,060E+02	8,74678E+04
0,30000	1,541E+03	1,373E+02	1,10E+05	6,298E+01	1,122E+02	1,11999E+05
0,35000	1,493E+03	1,466E+02	1,34E+05	5,916E+01	1,161E+02	1,35446E+05
0,40000	1,452E+03	1,537E+02	1,55E+05	5,590E+01	1,184E+02	1,57264E+05
0,84000	4,823E+02	5,160E+01	1,59E+05	6,172E+00	1,321E+01	1,59306E+05
0,86000	4,535E+02	4,970E+01	1,67E+05	5,457E+00	1,196E+01	1,67047E+05
0,88000	4,156E+02	4,777E+01	1,83E+05	4,583E+00	1,053E+01	1,83690E+05
0,90000	3,685E+02	4,586E+01	2,15E+05	3,602E+00	8,966E+00	2,15282E+05
0,92000	3,122E+02	4,402E+01	2,76E+05	2,585E+00	7,292E+00	2,76202E+05
0,94000	2,468E+02	4,229E+01	4,07E+05	1,616E+00	5,539E+00	4,07623E+05
0,96000	1,726E+02	4,072E+01	7,72E+05	7,904E-01	3,730E+00	7,72287E+05
0,98000	9,001E+01	3,938E+01	2,65E+06	2,15E-01	1,881E+00	2,65499E+06

$$K_{P_2} = \frac{P_4^{1/2}}{P_1}; \tag{33}$$

$$K_{P_3} = \frac{P_5 P_1}{P_2 P_4}. \tag{34}$$

The indices to the pressures correspond to the components of the vapor phase in the order indicated above.

The pressure P_3 of the hydrogen isotopes is determined on the basis of Eq. (4) using (11), (12), (16), (17), (27), (28), and the data of Table 3. The lithium partial pressure above the solution can be found from the well-known expression

$$P_1 = P_1^0 \gamma_1 (1 - x), \tag{35}$$

where P_1° is the saturation pressure of pure lithium at the given temperature.

The partial pressure of lithium hydride is determined from Eq. (32);

$$P_2 = P_1 P_3^{1/2} / K_{P_1}. \tag{36}$$

From (33) and (35) we have

$$P_4 = (K_{P_2} P_1^0)^2 \, \gamma_1^2 \, (1 - x)^2. \tag{37}$$

Similarly, from (34)-(37) we have

$$P_5 = (K_{P_3} K_{P_2}^2 P_1^{02} / K_{P_1}) \, P_3^{1/2} \gamma_1^2 \, (1 - x)^2. \tag{38}$$

The results of a calcualtion of the total vapor pressure P and of the partial pressures of the components in the Li—LiH, Li—LiD, and Li—LiT systems for a number of temperatures are summarized in Tables 5, 6, and 7. Literature data were used in the calculations: [11, 12] for P_1° and [13] for K_{P_1} and K_{P_2}. The equilibrium constant K_{P_3} was obtained by G. S. Aslanyan and E. A. Tsirlina with allowance for data on the thermodynamic functions of molecules of the Li_2H type found in [14].

The appearance of a minimum in the function P = f(x), which was pointed out as long ago as in [15], should be noted.

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