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EXPERIMENTAL INVESTIGATION OF HEAT CONDUCTION AND OF A TEMPERATURE JUMP IN BINARY MIXTURES OF NONREACTING GASES WITH ONE CONDENSING COMPONENT

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Experimental data on heat conduction and a temperature jump in binary mixtures of nonreacting gases with one condensing component in a low-pressure region are presented. The results have been processed with account for modern concepts of interaction of differently structured gases with a surface during energy transfer. It is shown that it is possible to obtain data on the thermal conductivity of the vapor of high-boiling substances in a low-pressure region in the presence of a foreign noncondensing impurity when its evacuation from a measuring cell is difficult or impossible.

One of the problems of modern experimental investigations of the transport properties of differently structured gases is measurement of the thermal conductivity of the vapor of high-boiling substances, for example, metal vapor. The physicochemical properties of many metals are such that the pressure of their vapor in experimentally implemented temperature ranges is much lower than atmospheric. Under these conditions, in measurement of the thermal conductivity of gases, the correction for a temperature jump at the gas–measuring cell interface becomes determining. The value of the correction depends on the structure of the gas molecules, their thermal accommodation on the surface, and on the regime of flow, i.e., on the ratio between the values of a mean free path of molecules and the characteristic (the smallest) size of the measuring cell.

The problems of the formation of a temperature jump and its exclusion from theoretical and experimental data on the thermal conductivity of pure nonreacting and dissociating gases under the conditions of local thermochemical equilibrium have been discussed at greater length in [1–7] in relation to investigations of inert gases, air, sulphur hexafluoride, steam, vapor of carboxylic acids, and vapor of alkali metals.

In our opinion, the problem of the formation of a temperature jump in binary mixtures of nonreacting gases and especially in the mentioned mixtures with one noncondensing component requires separate theoretical analysis. The above-mentioned situation often arises in measuring the thermal conductivity of the vapor of high-boiling substances in the region of low pressures, where, for some reason, the measuring cell contains a foreign noncondensing gas along with the main condensing component and separation of the mixture is difficult or impossible by the conditions of the experiment. Therefore, the main tasks of this work are:

(1) experimental investigation and a subsequent analysis of the problems of the formation of a temperature jump and determination of the heat-conduction coefficient of the main condensing component in binary mixtures of well-studied substances with prescribed compositions and pressures;

(2) model analysis of these same experimental data under the conditions of measurement of the thermal conductivity of the vapor of high-boiling substances with an admixture of a foreign unknown gas and development of appropriate recommendations;

(3) analysis of the available experimental data on the thermal conductivity of the vapor of metals with a foreign gas impurity.

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TABLE 1. Experimental Data on the Thermal Conductivity of H_2O–Ne and H_2O–Xe Mixtures

p_{H_2O}, mm Hg	X_2	$\lambda_{exp}\cdot10^4$, W/(m·K)			$\lambda_{mix}\cdot10^4$, W/(m·K)	$\lambda_{calc}\cdot10^4$, W/(m·K)
		cell No. 1	cell No. 2	cell No. 3		
H_2O–Ne mixture; p_{0Ne} = 0.190 mm Hg; Kn_{Ne} = 5.496 (cell No. 3)						
0.157	0.547	71.80	44.78	30.80	303	321
0.216	0.468	83.78	53.54	37.30	285	300
0.319	0.373	10.8	67.59	48.48	270	278
0.509	0.272	127.8	89.76	66.95	256	256
0.659	0.224	142.1	107.7	78.46	244	248
1.246	0.132	172.4	139.7	114.1	231	231
1.928	0.090	186.2	161.3	137.9	222	220
2.905	0.061	194.2	176.5	157.9	217	214
4.072	0.044	198.9	185.6	170.9	216	212
6.478	0.028	202.0	194.2	183.1	212	211
9.139	0.020	203.9	197.9	189.7	212	210
17.40	0.011	208.4	203.3	198.1	213	209
29.12	0.006	209.5	206.1	199.8	211	208
H_2O–Ne mixture; p_{0Ne} = 0.752 mm Hg; Kn_{Ne} = 1.389 (cell No. 3)						
0.105	0.877	135.5	87.02	60.73	435	440
0.161	0.824	147.6	96.01	67.72	435	416
0.214	0.778	155.1	104.4	72.53	417	396
0.333	0.693	172.7	116.6	84.70	392	364
0.511	0.595	189.9	134.1	99.77	357	332
0.656	0.534	200.5	146.2	111.0	345	316
1.244	0.377	221.1	176.6	142.7	282	280
1.936	0.280	227.2	193.6	164.6	282	258
2.955	0.203	226.4	203.1	180.9	260	244
4.008	0.158	224.1	207.2	189.9	247	236
6.527	0.103	219.8	209.4	197.9	233	224
9.232	0.075	217.0	209.5	201.5	226	216
17.54	0.041	212.6	209.2	204.8	216	212
29.26	0.025	212.9	210.1	206.0	216	210
H_2O–Xe mixture; p_{0Xe} = 0.147 mm Hg; Kn_{Xe} = 2.797 (cell No. 3)						
0.031	0.826	16.77	10.16	7.05	79	81
0.058	0.717	24.40	15.24	10.73	87	96
0.092	0.615	31.24	19.97	14.18	111	109
0.140	0.512	41.20	26.97	19.31	111	124
0.223	0.397	56.84	38.53	28.15	133	139
0.329	0.309	74.33	52.46	38.84	143	154
0.438	0.251	88.68	64.48	48.89	154	164
0.594	0.198	104.5	79.54	61.28	159	173
0.768	0.161	118.5	93.30	73.71	168	180
1.136	0.114	139.2	114.8	93.49	182	188
1.765	0.077	159.9	138.4	120.1	196	195
2.495	0.056	171.6	154.7	139.1	196	198
3.952	0.036	183.8	171.5	159.2	200	202
6.808	0.021	192.8	185.1	178.3	202	204
9.139	0.016	194.6	190.0	183.7	201	205
17.37	0.009	200.4	196.4	194.4	204	206
33.92	0.004	203.5	202.2	200.5	205	207
H_2O–Xe mixture; p_{0Xe} = 0.869 mm Hg; Kn_{Xe} = 0.473 (cell No. 3)						
0.065	0.930	48.69	37.82	29.83	73	69
0.089	0.907	52.98	41.48	32.69	79	72
0.118	0.880	55.96	44.01	34.86	81	76
0.169	0.837	60.66	47.93	38.24	87	80
0.216	0.801	64.67	51.47	41.25	92	84
0.290	0.750	71.53	57.65	46.44	98	90
0.385	0.693	78.87	65.05	52.54	103	97
0.509	0.631	87.46	72.69	59.71	111	107
0.657	0.570	95.43	79.97	66.12	124	116
0.958	0.476	112.0	96.38	81.69	136	125
1.251	0.410	123.9	108.2	94.24	148	137
1.823	0.323	140.3	126.9	112.2	159	152
2.500	0.258	152.9	140.2	127.1	171	163
3.831	0.185	168.3	158.9	147. 4	180	176
6.164	0.124	180.5	174.2	163.4	190	187
10.59	0.076	191.9	186.1	181.6	198	195
14.86	0.055	196.1	190.8	187.9	200	198
21.87	0.038	199.0	195.9	193.1	203	201
30.52	0.028	199.1	198.4	195.4	202	203
42.33	0.020	202.2	201.6	198.2	206	205
42.42	0.020	202.3	201.1	198.1	206	205

The studies in [1–7] were based on the Smoluchowskii equation:

$$(1/\lambda_{\mathrm{exp}}) = (1/\lambda_{\mathrm{true}}) + AB_{\mathrm{ef}}/p\,, \tag{1}$$

which relates the measured λ_{exp} and the true (molecular) λ_{true} thermal conductivities of a gas in the region of low pressures irrespective of the gas structure and the character of intermolecular interaction. The term AB_{ef}/p is a correction for the temperature jump. The term A is the so-called geometry factor of a temperature jump; $A = (r_1 + r_2)/(r_1 r_2 \ln (r_1 r_2))$ for a cylindrical cell with surface radii r_1 and r_2, $A = 2/(r_2 - r_1)$ for a plane cell with surface coordinates r_1 and r_2, and $A = (r_1^2 + r_2^2)/(r_1 r_2 (r_2 - r_1))$ for a spherical cell with surface radii r_1 and r_2. The term B_{ef} is the physical factor (hereinafter simply the factor) of the temperature jump related to the structure of gas molecules, the character of intermolecular interactions, and the accommodation of the energy of molecules on the surface of the cell. In [3] it is shown that in a particular case of a binary mixture of nonreacting gases Eq. (1) becomes

$$(1/\lambda_{\mathrm{exp}}) = (1/\lambda_{\mathrm{true\,mix}}) + AB_{\mathrm{mix}}/p_{\mathrm{mix}}\,, \tag{2}$$

$$B_{\mathrm{mix}} = [(2 - \xi_{\mathrm{mix}}\alpha_{\mathrm{mix}})/2\alpha_{\mathrm{mix}}]\,[(X_1/B_1) + (X_2/B_2)]^{-1}\,, \tag{3}$$

where $X_1 = p_s/p_{\mathrm{mix}}$, $X_2 = p_0/p_{\mathrm{mix}}$, $p_{\mathrm{mix}} = (p_s + p_0)$, $B_1 = 8(\gamma_1 - 1)T/((\gamma_1 + 1)V_1)$, $B_2 = 8(\gamma_2 - 1)T/((\gamma_2 + 1)V_2)$, T is the mixture temperature, $\gamma_{1,2} = (C_p/C_v)_{1,2}$ is the ratio of isobaric and isochoric heat capacities of each of the components, and $V_{1,2} = (8RT/(\pi M_{1,2}))^{0.5}$ are the mean velocities of the thermal motion of the molecules of the components. The effective coefficient of mixture energy accommodation α_{mix} can be found from the formula [3]

$$\alpha_{\mathrm{mix}} = \frac{\alpha_1 X_1 V_1\,(\gamma_1 + 1)/(\gamma_1 - 1) + \alpha_2 X_2 V_2\,(\gamma_2 + 1)/(\gamma_2 - 1)}{X_1 V_1\,(\gamma_1 + 1)/(\gamma_1 - 1) + X_2 V_2\,(\gamma_2 + 1)/(\gamma_2 - 1)}\,. \tag{4}$$

The function ξ_{mix} is a complicated function of the mixture composition and of the Knudsen number of the mixture and is among the subjects of investigation in this work.

An analysis of relations (1)–(4) shows that to determine λ_{mix} in the region of low pressures it is possible to use a method of several measuring cells of different geometries which has already been used in [6, 7] to determine the thermal conductivity of pure gases and steam. The method employs measurement of λ_{exp} simultaneously by several (in our case, three) measuring cells having different A and being under the same conditions. According to (2), extrapolation of the straight line or of the slightly curved line $(1/\lambda_{\mathrm{exp}}) = f(A)$, passing through experimental points, to the ordinate axis gives the value of $\lambda_{\mathrm{mix}}(X_1, p_{\mathrm{mix}})$. Thus, the method makes it possible to find the molecular thermal conductivity of the mixture only on the basis of experimental data. A detailed analysis of the curves will, probably, allow one to determine the components (3) and (4).

Measurements were made by three cells organized according to a heated-filament method. The filaments are tungsten wires with radii r_1 = 0.054, 0.025, and 0.0155 mm. Their length is equal to about 195 mm. The capillaries are made of a molybdenum tube with inner radius r_2 = 3.40 mm. Thus, cell Nos. 1, 2, and 3 (see Table 1) had the geometry factors of a temperature jump A = 4.541, 8.202, and 12.022 mm^{-1}, respectively.

In the present work, the binary mixtures selected were mixtures of inert gases (neon and xenon) with steam. As has already been mentioned, these substances were studied in [6, 7] and dependences of the function ξ on the Knudsen number were obtained for them. A binary mixture with steam was prepared in the following way. A portion of an inert gas is admitted into an exhausted and thermostatted working section which has measuring cells and which is connected with an evaporation tank with distilled water frozen to the

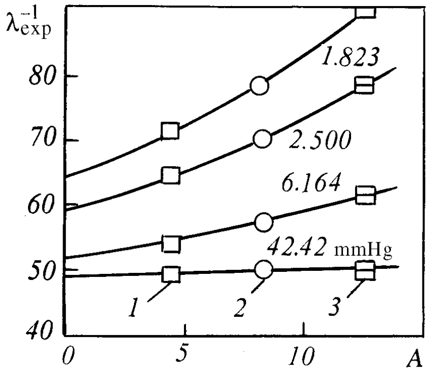


Fig. 1. Dependence of $\lambda_{\text{exp}}^{-1}$ on the geometry of the measuring cell for an H_2O–Xe mixture ($p_{0\text{Xe}}$ = 0.869 mm Hg) at different values of steam (indicated in the figure): 1–3) cell numbers. $\lambda_{\text{exp}}^{-1}$, m·K/W; A, mm^{-1}.

temperature of liquid nitrogen. The inert gas pressure is measured by a McLeod compression manometer with an error not higher than ±1%. Then, the working section is closed and the evaporation tank is heated to a temperature corresponding to the required pressure of steam. The pressure of the steam is determined by the temperature of the evaporation tank and in accordance with the recommendations of [8, 9].

The reliability of all the units of the experimental setup was verified by numerous studies of the thermal conductivity of different gases and vapor [5–7]. The error in the determination of λ_{exp} is not more than 2%. The H_2O–Ne ($p_{0\text{Ne}}$ = 0.190 and 0.752 mm Hg) and H_2O–Xe ($p_{0\text{Xe}}$ = 0.147 and 0.869 mm Hg) mixtures were investigated on the 325 K isotherm. Table 1 presents experimental results and also the values of the molecular thermal conductivity of the mixture λ_{mix}; they were obtained by processing experimental data in the coordinates $\lambda_{\text{exp}}^{-1} - A$. Figure 1 shows the possibility of determining $\lambda_{\text{mix}}(X_1, p_{\text{mix}})$ by the method of several measuring cells. The accuracy of the determination of λ_{mix} depends, first of all, on the minimum value of A and the extrapolation "range" of the curve $f(A)$ to the ordinate axis. In this case, the error in determining λ_{mix} is evaluated to be 8–10% at minimum pressures of the experiments and it decreases with increase in pressure.

Table 1 gives the values of the Knudsen number for cell No. 3 at pressures of inert gases. As follows from Table 1, the main body of experimental data for mixtures has been obtained in the region of the temperature jump ($\text{Kn}_{\text{mix}} < 1$); therefore, the notion of the thermal-conductivity coefficient λ_{true} can be used for all experimental points.

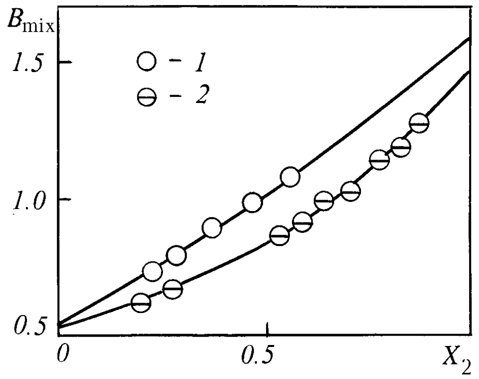
To estimate the results obtained, the values of λ_{mix} obtained in this work were compared with calculated values of $\lambda_{\text{mix.calc}}$. Because of the absence at the present time of a theory for accurate calculation of the thermal conductivity of a mixture of polyatomic gases, usually semiempirical methods are used, most of which in the case of a binary mixture lead to the equation [10]

$$\lambda_{\text{mix}} = \lambda_1/[1 + A_{12}\,(X_2/X_1)] + \lambda_2/[1 + A_{21}\,(X_1/X_2)]\,, \tag{5}$$

in which λ_1 and λ_2 are the thermal conductivities of the components. The parameters A_{12} and A_{21} for a mixture in which one gas is polar can be calculated in terms of the viscosities of the components η_1 and η_2 and their molecular masses [10]:

$$A_{ij} = 1.065\,[1 + \eta_i/\eta_j)^{0.5}\,(M_j/M_i)^{0.25}]^2 / \left\{2\sqrt{2}\,[1 + (M_i/M_j)]^{0.5}\right\}. \tag{6}$$

A comparison (see Table 1) indicates a fairly good agreement with the results of calculation obtained for each of the two mixtures with different pressures of inert gases. A noticeable (up to 9%) discrepancy is observed only for an H_2O–Ne mixture at a minimum pressure of steam.



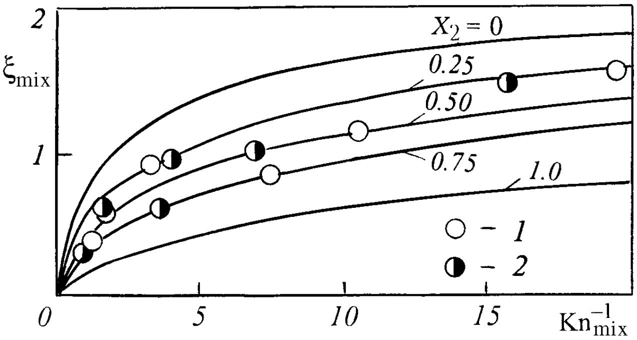


Fig. 2. Dependence of the factor of a temperature jump B_{mix} of an H_2O–Ne mixture on the composition of the mixture and pressure of impurity: 1) $p_{0\text{Ne}}$ = 0.190 mm Hg; 2) 0.752. B_{mix}, K·sec/m.

Fig. 3. Dependence of ξ_{mix} on the Knudsen number and composition for mixtures of steam and inert gases: 1) H_2O–Xe; 2) H_2O–Ne.

The data obtained for $\lambda_{\text{exp}}(X_1, p_{\text{mix}})$ and $\lambda_{\text{mix}}(X_1, p_{\text{mix}})$ make it possible, using Eq. (2), to determine the temperature-jump factor $B_{\text{mix.exp}}$ with different compositions of the mixture and pressure of impurity. The results of calculation for an H_2O–Ne mixture are presented in Fig. 2. An analysis of the data on $B_{\text{mix.exp}}$ has shown that the best approximation of experimental points in Fig. 2 is given by the expression

$$B_{\text{mix.exp}} = \left\{X_1 \left[2\alpha_1/((2-\xi_1\alpha_1)\, B_1)\right] + X_2 \left[2\alpha_2/((2-\xi_2\alpha_2)\, B_2)\right]\right\}^{-1}, \tag{7}$$

where the dependences of ξ_1 and ξ_2 of pure components on the Knudsen number (see Fig. 3) and the values of the accommodation coefficients α_1 and α_2 were taken from [6, 7]. For (7), the Knudsen number of mixture Kn_{mix} is given by the expression

$$\text{Kn}_{\text{mix}} = \frac{kT\,[X_1 V_1 + X_2 V_2]}{\pi\sqrt{2}\, p_{\text{mix}} r_1 \ln (r_2 r_1)\, [X_1^2 \sigma_{11}^2 V_1 + 2X_1 X_2 \sigma_{12}^2 V_{12} + X_2^2 \sigma_{22}^2 V_2]}\,. \tag{8}$$

The collision cross sections σ_{11}^2, σ_{12}^2, and σ_{22}^2 were taken from [10].

A comparison of (3) and (7) yields the dependence of the accommodation group $(2 - \xi_{\text{mix}}\alpha_{\text{mix}})/2\alpha_{\text{mix}}$ and, consequently, of the function ξ_{mix} on the composition of the mixture and Kn_{mix}. The results of the calculation of ξ_{mix} are presented in Fig. 3. An analysis of this figure shows that the separation of the curves $\xi_{\text{mix}}(\text{Kn}_{\text{mix}})$ at different compositions of the mixture occurs only at different dependences $\xi_1(\text{Kn})$ and $\xi_2(\text{Kn})$ of pure components. For a mixture of monatomic gases, for which $\xi(\text{Kn})$ is described by a single curve [6], one should expect the existence of the dependence $\xi_{\text{mix}}(\text{Kn}_{\text{mix}})$, which is the same for all compositions.

To study the possibility of determining the thermal conductivity of the main condensing component from experiments at low pressures p_s in the presence of a foreign unknown noncondensing impurity, we present the data of Table 1 in Fig. 4. It follows from Fig. 4 that the thermal conductivity of the main condensing component for all of the measuring cells of the present work is determined rather reliably, and the results obtained mean that in measuring the thermal conductivity of metal vapor or the vapor of other high-boiling substances one may ignore the presence of a foreign noncondensing impurity in a measuring cell. Rather accurate values of λ_{true} of the main condensing component can be obtained by constructing experimental data in the coordinates $(1/\lambda_{\text{exp}}–1/p_s)$. It should be kept in mind that the pressure of a noncondensing impurity must be of the same order of magnitude as the pressure of the main component.

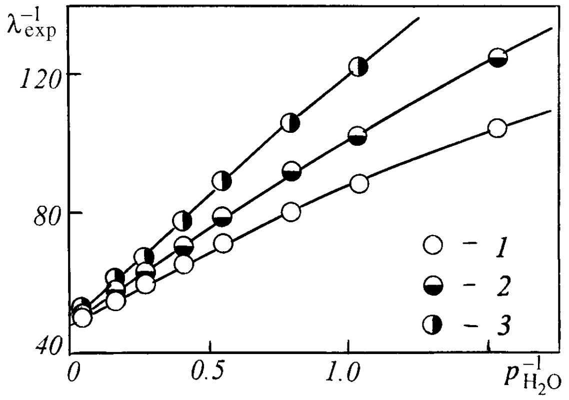
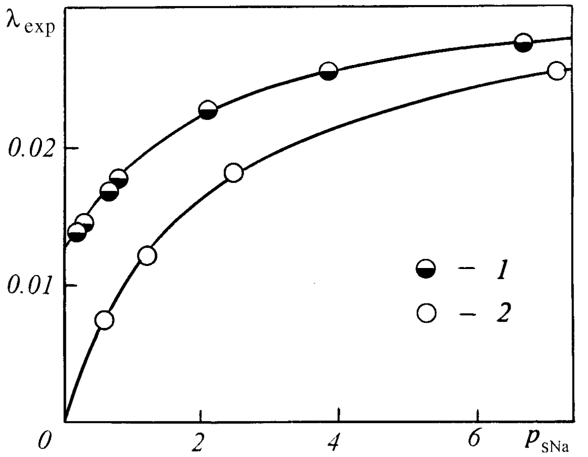


Fig. 4. Experimental data for an H_2O–Xe mixture (p_{0Xe} = 0.869 mm Hg) in the coordinates λ_{exp}^{-1}–$p_{H_2O}^{-1}$: 1) cell No. 1; 2) No. 2; 3) No. 3. p^{-1}, (mm Hg)$^{-1}$.

TABLE 2. Experimental Data on the Thermal Conductivity of an Na–H_2 Mixture and Pure Vapor of Na on the 1050 K Isotherm

Pure hydrogen	Mixture of Na vapor with hydrogen						Pure vapor of Na	
	p_{Na}, mm Hg	p_{mix}, mm Hg	X_2	$\lambda_{exp}\cdot10^4$, W/(m·K)	$\lambda_{mix}\cdot10^4$, W/(m·K)	B_{mix}	p_{Na}, mm Hg	$\lambda_{exp}\cdot10^4$, W/(m·K)
λ_{H_2} [13] = 0.4670 W/(m·K); B_{H_2} = 2.00; α = 0.158 (for ξ = 0); p_{H_2} = 1.245 mm Hg	0	1.245	1.000	120.3	44670	2.000	0.594	75.82
	0.216	1.461	0.852	138.9	887	1.698	0.595	75.53
	0.322	1.567	0.795	147.0	613	1.607	1.218	123.6
	0.667	1.912	0.651	167.9	449	1.414	2.538	181.8
	0.808	2.053	0.606	179.5	450	1.364	7.452	255.1
	2.132	3.377	0.369	227.3	372	1.146	13.832	285.7
	3.864	5.109	0.244	257.7	352	1.058	14.250	287.1
	6.688	7.933	0.157	279.2	340	1.003	21.242	306.6
	25.48	26.72	0.046	319.2	338	0.941		

Table 2 and Fig. 5 give experimental data on the measurement of the thermal conductivity of sodium vapor on the 1050 K isotherm as a function of pressure. The measurements were made by a heated-filament method with a zero section for corrosive media; the main body of the experimental data was published in [11]. A measuring cell has the following dimensions: r_1 = 0.0502 mm; r_2 = 2.80 mm; L_{fil} = 165.76 mm; the geometry factor of a temperature jump is A = 5.0424 mm^{-1}. As follows from Fig. 5, in the first series of measurements the experimentally determined thermal conductivity coefficient λ_{exp} of sodium vapor does not reach the value λ_{exp} = 0 at p = 0, indicating the presence of a foreign noncondensing gas in the measuring cell. Figure 6 presents the mentioned data in the coordinates $(1/\lambda_{exp})$–$(1/p_{sNa})$. Just as in the case of the mixture of steam with inert gases, extrapolation of the approximation curve to the ordinate axis makes it possible to determine the thermal conductivity of the main condensing component. In the discussed experiment with sodium vapor, it was possible to evacuate a foreign gas from the measuring cell. As follows from Fig. 5, in the second series of measurements, λ_{exp} of sodium tends to zero at p = 0, indicating the absence of a foreign noncondensing gas in the measuring cell. The data of the second series are presented in Fig. 6 and are in good agreement with the results of the first series. It follows from comparison of the results of both series of measurements in Fig. 6 that the construction of experimental data in the coordinates $(1/\lambda_{exp})$–$(1/p_s)$ allows the determination of the true thermal conductivity of the main condensing component,



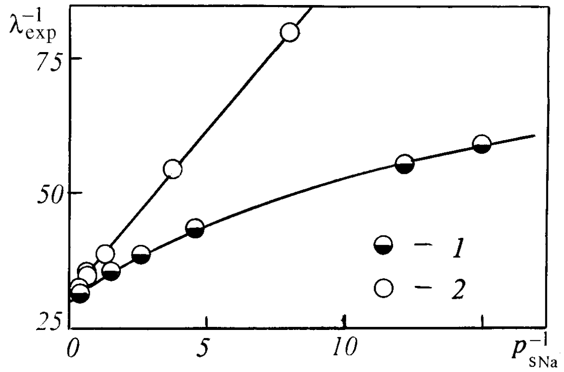


Fig. 5. Dependence of λ_{exp} of sodium vapor (two series of measurements) on pressure [11, 12]: 1) first series of measurements (mixture of Na and H_2 vapors); 2) second series of measurements (pure Na vapor). λ_{exp}, W/(m·K); p_{sNa}, mm Hg.

Fig. 6. Experimental data for an Na–H_2 mixture (p_{H_2} = 1.245 mm Hg) [1) first series of measurements] and pure vapor of sodium [2) second series of measurements] in the coordinates λ_{exp}^{-1}–p_{sNa}^{-1}.

for example, metal vapor, without evacuating a foreign gas impurity. Thus, we can state that the third task posed in the present article has been positively solved.

Additional experiments on inflow into an exhausted closed cell allowed us to determine the character of a foreign gas. During the inflow, time dependences of pressure in the cell $p_{cell}(\tau)$ and the values of $(Q_{el}/\Delta t) - \tau$ were recorded and then analyzed. The technique of the experiment and experimental results are given in detail in [12]; an analysis of the data obtained disclosed the presence of hydrogen in the cell.

According to Eq. (1), the derivative of $\lambda_{exp}(p)$ at $p = 0$ is

$$(d\lambda_{exp}/dp)_{p=0} = (1/8)\,[2\alpha/(2-\xi\alpha)]\,[(\gamma+1)\,V(T)/((\gamma-1)\,T)]\,A^{-1}\,. \tag{9}$$

Using this relation and the data on inflow [12], we determined the factor of a temperature jump of hydrogen B_{H_2} and the coefficient of energy accommodation α_{H_2} at $\xi_{H_2} = 0$. The results of calculation are given in Table 2. At the known values of α_{H_2} and $\lambda_{exp}(p_{Na} \to 0)$, the pressure of hydrogen as an impurity in sodium vapor can be calculated by Eq. (1) in the first series of measurements (Table 2). The calculations showed that the pressure of a foreign gas — hydrogen — was p_{H_2} = 1.245 mm Hg. Since in this case $\mathrm{Kn}_{H_2} >> 1$, in the calculations we took the value of $\xi_{H_2} = 0$ [6]. In the calculations we used the data on $\lambda_{true}(T)$ for hydrogen [13].

It is shown in [14] that the coefficients of energy accommodation of alkali metal vapor ($\alpha \le 1$) that agree with theoretical notions can be obtained only for the upper limiting value $\xi = \xi_0 = 0.8533$. If we take $\xi = 0$ for alkali metal vapor for $p \to 0$, then the coefficients of energy accommodation of monomers take values much greater than unity. The rapid transition of the function ξ to its upper limiting value seems to be typical of dissociating gases, since a similar picture is observed also in steam (see Fig. 3). The results of calculation of B_{mix} by (7) with regard for the comments made relative to ξ_{H_2} and ξ_{Na} are presented in Table 2. This same table also contains the calculated results for the λ_{mix} of a mixture of sodium vapor with hydrogen after the introduction of a correction for the temperature jump in accordance with Eq. (2).

NOTATION

λ_{exp}, λ_{true}, and $\lambda_{true.mix}$, experimental, true, and true for gas mixture thermal-conductivity coefficients; A, geometry factor of a measuring cell; r_1 and r_2, radii of the filament and the inner surface of the tube of the measuring cell; B_{ef}, factor of the temperature jump; B_{mix}, factor of the temperature jump of a mixture of nonreacting gases; p, gas pressure; p_0, pressure of inert gas; p_s, saturation pressure of a condensing component; p_{mix}, pressure of a mixture; X_1 and X_2, mole fractions of components; $V(T)$, thermal velocities of molecules; M, relative molecular mass; C_p and C_v, isobaric and isochoric thermal conductivities; γ, ratio of isobaric and isochoric thermal conductivities; α_1, α_2, and α_{mix}, coefficients of energy accommodation of components and gas mixture; ξ_{mix}, correction function; σ, cross section for interaction; η, viscosity; Kn, Knudsen number; Q_{el}, electric power liberated by a heated filament.

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