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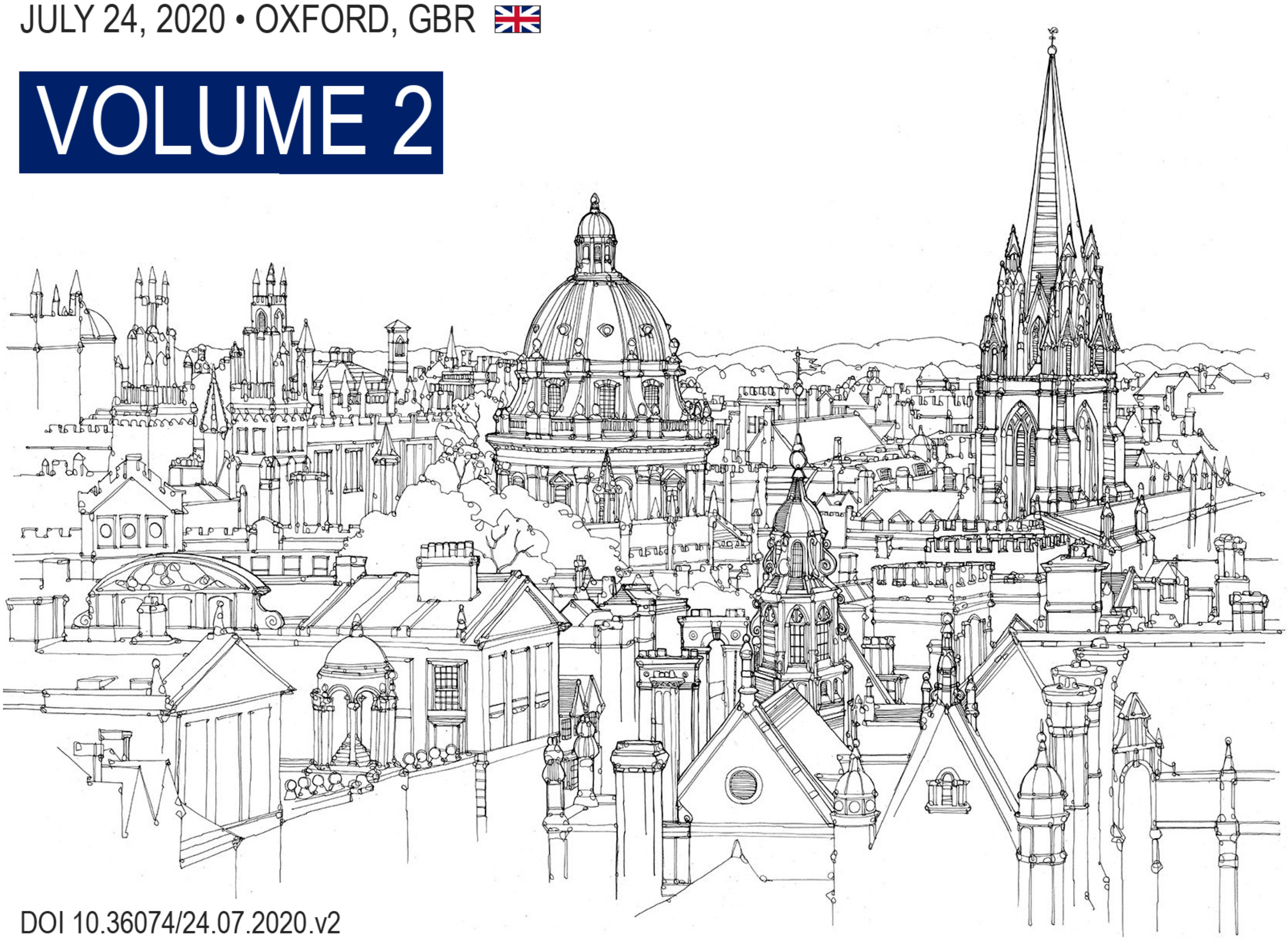

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SECTION VI.
CHEMISTRY

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EQUATIONS OF TEMPERATURE DEPENDENCE OF AN ENTHALPY AND AVERAGE HEAT CAPACITY FOR $EuCl_3 \cdot 6H_2O$

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In this work for europium chloride hexahydrate $EuCl_3 \cdot 6H_2O$ the equations of dependence of a molar enthalpy $H_T - H_{298.15}$ and average isobaric molar heat capacity $\overline{C_p}$ from absolute temperature T are offered.

Now in literature [1] there are only of $EuCl_3 \cdot 6H_2O$ in temperature range 298.15–600.00 K given for true isobaric molar heat capacity C_p, but there are no equations for the description it $H_T - H_{298.15}$ and $\overline{C_p}$. In article [2] it is shown that C_p and $\overline{C_p}$ are connected by a ratio:

$$C_p = \overline{C_p} + (T - 298.15)\frac{d\overline{C_p}}{dT} \quad (1)$$

It is also $\overline{C_p}$ possible to define from molar values of enthalpies [2]:

$$\overline{C_p} = (H_T - H_{298.15}) / (T - 298.15) \quad (2)$$

From the publication [3] it is known, that the dependence $H_T - H_{298.15}$ on absolute temperature *T* can be presented in the form $H_T - H_{298.15} = aT + bT^2 + cT^{-1} + d$, where *a*, *b*, *c*, *d* – coefficients. In this work, in view of results [2-4], the corresponding equations for $EuCl_3 \cdot 6H_2O$ are offered:

$$H_T - H_{298.15} = 366.909T + 0.007T^2 + 0.037 \cdot 10^7 T^{-1} - 111.257 \cdot 10^3 \quad (3)$$

$$H_T - H_{298.15} = 362T + 7 \cdot 10^{-3} T^2 + 37 \cdot 10^4 T^{-1} - 109794 \quad (4)$$

The equation (3) well describes data from the book I. Barin [1] (the maximum deviation does not exceed 0.13 %). To expression (4) we come on the basis of results [4]. Its maximum deviation is slightly higher (-1.36 %), if to compare with [1]. Additional examples are given in the table 1.

Table 1

Comparison of enthalpies of $EuCl_3 \cdot 6H_2O$ in the range 298.15–600.00 K, received at different approaches

T, K	$H_T - H_{298.15}$, kJ/mol		$\Delta(H_T - H_{298.15})$, %	$H_T - H_{298.15}$, kJ/mol	$\Delta(H_T - H_{298.15})$, %
	data [1]	by the equation (3)		by the equation (4)	
300.00	0.679	0.679	0.00	0.670	-1.36
400.00	37.505	37.551	0.12	37.051	-1.21
500.00	74.593	74.687	0.13	73.696	-1.20
600.00	111.943	112.025	0.07	110.543	-1.25

Note. *In all considered cases at a temperature of 298.15 K an enthalpy $H_T - H_{298.15}$ = 0.000 kJ/mol.*

On the basis of the equations (3) and (4), having applied recommendations from [2, 3] and some results from [4], for $EuCl_3 \cdot 6H_2O$ formulas (5) and (6) describing the temperature course $\overline{C_p}$ is offered:

$$\overline{C_p} = 368.996 + 0.007T - 1240.986T^{-1} \quad (5)$$

$$\overline{C_p} = 364.087 + 0.007T - 1240.986T^{-1} \quad (6)$$

The maximum difference between the values, received when calculating behind the equations (5) and (6), does not exceed 1.34 %.

In conclusion we will note, that equation (4) and (6), received by means of a method [4], are perhaps less exact. However approach from [4] can be more universal. Likely with its help it is possible to predict heat capacity for many compounds $LnCl_3 \cdot 6H_2O$, where Ln – rare-earth metals.

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