Heat Capacities of Organic Compounds in the Liquid State

I. C_1 to C_{18} 1-Alkanols

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Received June 2, 1989; revised manuscript received August 7, 1989.

Heat capacities of liquid C_1 to C_{18} 1-alkanols measured by calorimetric methods were compiled and evaluated. The selected experimental data were fitted as a function of temperature with cubic splines using weighted least squares minimization. The parameters of the cubic spline polynomials and the recommended values for heat capacities are presented. A new quasi-polynomial equation which permits extrapolation of heat capacities outside the temperature range of experimental values was derived and its parameters for C_1 to C_{10} 1-alkanols are presented.

Key words: 1-alkanols; calorimetry; critically reviewed data; cubic splines; evaluation; heat capacity; liquids; temperature correlation.

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1. Introduction

Detailed information on thermophysical and equilibrium thermodynamic data for the important homologous series of organic compounds is of both theoretical and practical interest. The Subcommittee on Thermodynamic Data of the IUPAC Commission on Thermodynamics recently initiated several international data projects. The main purpose of these projects is to stimulate world wide cooperation of experimentalists and data evaluators, in order to establish representative and consistent data bases of evaluated data on different thermodynamic properties.

This article was prepared in connection with the IUPAC projects "The Vapor-Liquid Equilibria in 1-Alkanol + *n*-Alkanes Mixtures" and "The Heat Capacities of Liquid Substances". The main objective of this critical compilation is to review and evaluate all calorimetric data on heat capacities of 1-alkanols up to C_{18} in the liquid state, and to present the "best" recommended values obtained by temperature correlation of the data from the selected sources.

1.1. Previous compilations

Although attention has been paid over the last 20 years to the evaluation of thermodynamic properties of alcohols, there is no current critical compilation which would present temperature correlation of critically reviewed heat capacity data for the homologous series of 1-alkanols. New important measurements were pub-

lished recently (most of the data for C_{10} and higher 1-alkanols appeared within the last 10 years) and older evaluations need an updating.

Touloukian and Makita (70TOU/MAK) compiled and evaluated heat capacity data for 55 industrially important pure substances, including methanol and ethanol. As important new measurements were carried out for both alkanols in the meantime, their evaluation is not up-to-date anymore. In the Supplement to this compilation (76TOU/MAK) some other alcohols are included; the data were not, however, critically assessed and no recommendations were given.

The physicochemical data for aliphatic alkanols are summarized in a compilation by Wilhoit and Zwolinski (73WIL/ZVO); an overview of heat capacity sources is given but recommended values are presented only at one or more of three typical temperatures (melting point, normal boiling point, 298.15 K).

The most recent Soviet compilation of thermodynamic properties of oxygen containing organic compounds (84VAS/PET) also summarizes the data from the sources which are not readily available in the West. However, only the raw data from different sources are tabulated (with the estimation of their accuracy) without any comparison, correlation and recommendation.

An impressive amount of data sources is listed in the compilation of thermodynamic properties of organic compounds, in the condensed state, by Domalski and coworkers (84DOM/EVA). Heat capacity with the general evaluation of accuracy is given usually only at one temperature for each listed reference, no recommended values were generated.

Wilhoit *et al.* (85WIL/CHA) published a very thorough evaluation and correlation of heat capacity data in condensed phases for oxygen containing compounds C_1 to C_4. Their recommendations for the four lowest members of the homologous series of 1-alkanols are updated by this article as we include some recent sources which were not considered by them.

Two recent evaluations published in "non-open" literature are the recommended heat capacities for the liquid 1-alkanols C_1 to C_5 tabulated by the Thermodynamics Research Center of Texas A&M University (87TRC) and the recommended data generated for saturation heat capacities of aliphatic alcohols C_1 to C_{16} by the Engineering Science Data Unit (79ENG). In the latter report parameters of temperature correlation and recommended values are tabulated for the temperature range between melting point temperature and 320 to 400 K according to the type of the substance. Data sources which were used to establish the equations are listed, but no details about the assessment and selection process are given; for certain compounds where little experimental data were available the parameters were estimated.

Heat capacity data for 1-alkanols are also listed in a number of general tables of physicochemical properties; the most important of them are reviewed by Wilhoit *et al.* (85WIL/CHA). Either direct experimental or smoothed values are tabulated; although in most tables the references to the used data sources are presented, there is not usually any other specification available.

1.2. Types of Heat Capacity Data

Thermodynamics defines three types of heat capacities: isochoric, isobaric and saturation. While the first type is rarely determined experimentally for liquids, and is primarily of theoretical interest, the data for the other two heat capacities are reported in the literature.
Isobaric heat capacity is defined as

$$C_p = T(\partial S/\partial T)_p = (\partial H/\partial T)_p \tag{1}$$

and saturation heat capacity as

$$C_{sat} = T(\partial S/\partial T)_{sat} \tag{2}$$

where subscript sat denotes that pressure changes with temperature along the vapor-liquid saturation curve.

In most experimental determinations, a sample under investigation is heated or cooled; the amount of exchanged heat and the corresponding temperature change are measured. When the process is carried out at constant pressure, the isobaric heat capacity C_p is obtained. If the temperature change is performed under conditions of vapor-liquid equilibrium, the experimental value is saturation heat capacity C_{sat}. In this case the heat capacity of a two phase system is measured. This quantity has to be converted to C_{sat} using correction for heat capacity of vapor and enthalpy of vaporization which both contribute to the total value of the measured heat (46HOG).

Heat capacities are related by definition to temperature derivatives of entropy, and the experimental values corresponding to finite temperature change cannot be automatically considered as C_p and C_{sat} defined by Eqs. (1) and (2). The heat capacity of organic liquids changes moderately with temperature (except in the region of high vapor pressures) and the true heat capacity equals in most cases the experimental value within the error of measurement if the temperature increment does not exceed several degrees (temperature changes between 3 to 8 K are the most frequent). When the temperature change in the experiment is above 10 K, the value obtained is denoted in the following tables as average heat capacity C_{avg}. This type of quantity has never been used for establishing recommended values.

Below the normal boiling temperature the experimental isobaric heat capacity usually relates to the atmospheric pressure though it is not frequently specified in the original source. C_p depends little on pressure at low and moderate vapor pressures, and its effect can be neglected unless the pressure change is large. Above the normal boiling temperature the saturation heat capacities rather than C_p data are reported in the original literature. Measurements with pure 1-alkanols at pressures remote from the vapor pressure are rare; they are interesting primarily for mixture investigation and no special atten-

where differences between experimental and smoothed values were roughly equal to or smaller than expected experimental errors. The final correlation of the selected experimental data was assigned a level of accuracy (I to VI) according to the quality of the correlated data.

The main criterion for judging the quality of the correlation was the standard weighted deviation, s_w:

$$s_w = [S_{min}/(n-m)]^{1/2} \quad (6)$$

where n is the overall number of the fitted data points and m is number of independent adjustable parameters in a correlation equation. When experimental data are consistent within the expected error limits, s_w should be close to unity. In addition, use of the following statistical criteria was made:
the standard deviation

$$s = \{[\sum_{i=1}^{n}(C_{sm} - C_{exp})_i^2]/(n-m)\}^{1/2}, \quad (7)$$

the percentage standard deviation

$$s_r = \{[\sum_{i=1}^{n}((C_{sm} - C_{exp})/C_{exp})_i^2]/(n-m)\}^{1/2} \cdot 100, \quad (8)$$

the bias

$$s_b = [\sum_{i=1}^{n}(C_{sm} - C_{exp})_i]/n. \quad (9)$$

and the difference between the number of experimental points with positive and negative deviation from the smoothed values (denoted in tables as +/−).

In order to get information on how data from individual sources compared with the final correlation the deviations d_w, d, d_r and d_b defined analogously to s_w, s, s_r and s_b were calculated for both included and rejected data sets. The definitions are as follows:

the average weighted deviation

$$d_w = \{[\sum_{i=1}^{n_1}((C_{sms} - C_{exp})^2/\sigma^2 C^1)_i]/n_1\}^{1/2}, \quad (10)$$

the average deviation

$$d = \{[\sum_{i=1}^{n_1}(C_{sm} - C_{exp})_i^2]/n_1\}^{1/2}, \quad (11)$$

the average percentage deviation

$$d_r = \{[\sum_{i=1}^{n_1}((C_{sm} - C_{exp})/C_{exp})_i^2]/n_1\}^{1/2} \cdot 100, \quad (12)$$

the bias of a data set

$$d_b = [\sum_{i=1}^{n_1}(C_{sm} - C_{exp})_i]/n_1 \quad (13)$$

where n_1 denotes the number of data points in one data set.

2.2. Correlation Equations

When examining the possible approaches to the temperature correlation of heat capacity data, two main criteria were considered:

1. The ability to fit precisely the selected experimental data over the whole temperature range with a relatively small number of parameters.

2. The possibility of a meaningful extrapolation above the upper temperature limit of experimental data.

A polynomial equation appears to be the most dependable in describing heat capacity as a function of temperature and has been used for description of C_p or C_{sat} of alcohols in most previous compilations (70TOU/MAK, 85WIL/CHA) where the parameters of the regression equation were listed. The temperature dependence of the heat capacity for 1-alkanols is rather complex and a polynomial of up to the eighth degree might be needed in cases where data are available over a wide temperature range. The substantial drawback of the polynomials of a high degree is a possibility of oscillation and ill conditioning of parameters. We preferred to fit the selected experimental values with cubic splines which proved to be useful in describing complex functions in a number of technical applications.

The principle of the interpolation by cubic splines is as follows. The overall interval of independent variable (temperature) $<T_{min}, T_{max}>$ is divided in $k-1$ subintervals which are delimited by temperatures $T_{min} = T_1, ..., T_j, ..., T_k = T_{max}$ called knots. The heat capacity as a function of temperature is approximated between the neighboring knots by polynomials cubic in temperature. The basic property of the splines is that the $j-1^{th}$ and the jth polynomials must have at temperature T_j not only the same values of heat capacity but also identical first and second temperature derivatives. As the overall temperature range is described by $k-1$ cubic polynomials (each having four parameters) and the above three constraints apply to $k-2$ knot temperatures T_j, there are $(k-1)4 - (k-2)3 = k+2$ independent adjustable parameters. They are expressed as the heat capacity values at k knot temperatures and two further constraints, typically taken as boundary conditions at T_1 and T_k. The zero second derivative end conditions are the most common (natural spline).

When using cubic splines for smoothing experimental data the knot temperatures have to be chosen first and then the heat capacity values at knots are adjusted by a spline correlation routine in order to minimize the objective function S defined by Eq. (4). We used the correlation algorithm developed at the Technical University of Budapest (79KOL) in which the two boundary conditions are considered during minimization as two additional adjustable parameters. Three to four knots (i. e. five to six independent parameters) were necessary for the satisfactory fit of the data for 1-alkanols within the expected experimental errors.

The results of spline correlation are usually reported in terms of the knot values and two boundary conditions;

the spline routine is then necessary for generating the recommended data. As we expect that this routine is not available to all users of the data we preferred to tabulate directly the parameters of cubic polynomials which are easier to use. A single polynomial linear in temperature was used for one compound where data were available in a limited temperature range only. The adjustable parameters A_j relate to the equation

$$C/R = \sum_{j=0}^{m} A_j(T/100)^j, \tag{14}$$

where R is the gas constant. The upper limit of the summation m is equal to 3 in all cases where the overall temperature range is subdivided (cubic splines fitting) or can be lower when only one polynomial is used to describe the data. Dividing temperature by a scaling factor of 100 improved the numerical stability of the set of normal equations used in determining the parameters.

The cubic splines are very flexible when describing the temperature dependence of heat capacity inside the limits of the temperature range of experimental data, i.e. they are excellent for interpolation. However, the cubic splines cannot be used for a meaningful extrapolation. Thus, another correlation equation was proposed which should provide for a reasonable extrapolation, especially towards the critical point. The derivation of this new relationship — further denoted as "quasi-polynomial equation" — is based on the assumption that the heat capacity of most organic liquids is an increasing function of temperature. The only exceptions occur for a few substances which show a shallow minimum a few degrees above the triple point. Such behavior is only observed with precise measurements. As the quasi-polynomial equation is aimed primarily at applications where emphasis on the extrapolation capability rather than on a perfect fit of experimental data, the possible presence of a minimum in the heat capacity curve was ignored.

Consider that the first derivative of heat capacity with respect to variable $\tau = 1 - T/T_c$ is a quadratic function of the form

$$dC/d\tau = -(e_{-1}/\tau + e_1\tau + e_2\tau^2)^2 \tag{15}$$

where e_{-1}, e_1, e_2 are adjustable parameters. After integration one obtains

$$C = e_{-1}^2/\tau + e_0 - 2e_{-1}e_1\tau - e_{-1}e_2\tau^2 - e_1^2\tau^3/3 - e_1e_2\tau^4/2 - e_2^2\tau^5/5 \tag{16}$$

where e_0 is an adjustable parameter resulting from integration. Due to the form of Eq. (15), $dC/d\tau$ is always negative and the dC/dT must be always positive; therefore the right hand side of Eq. (16) is an increasing function of temperature. The term e_{-1}^2/τ provides for a sharp increase of heat capacity as the critical point is approached. This is in agreement with the theory of liquid state which predicts C_p and C_{sat} to be unbounded at T_c. Equation (16) can be modified to give a power series in τ

$$C/R = \sum_{i=-1}^{m} E_i\tau^i \tag{17}$$

where E_i are parameters related to the coefficients e_i in Eq. (16) and the upper limit of summation m equals 5.

2.3. Units, Conversion Factors, Temperature Scales

All numerical data reported in the tables are given in SI units. Factors for converting the values from the original sources to SI units are as follows:

1 cal = 4.1840 J
1 Btu $lb^{-1}(°F)^{-1}$ = 4.1868 J $K^{-1}g^{-1}$
$T/K = T/°C + 273.15$
$T/K = 0.55555\ T/°F + 255.37$
R = 8.31441 J $K^{-1}mol^{-1}$.

Molar masses were calculated from atomic masses recommended by the IUPAC Commission on Atomic Weights (84COM). The differences in temperature scales were neglected for two reasons. First, the highest relative error in heat capacity introduced by neglecting the difference between IPTS-68 and IPTS-48 temperature scales was in the range 10^{-4} to 10^{-5} percent which is several orders of magnitude smaller than the precision of the best heat capacity measurements. Second, it was not clear in some cases, particularly for older measurements, which temperature scale was adopted by the author.

3. Heat Capacity Data on 1-Alkanols — Availability, Consistency and Temperature Dependence

The literature search was limited to sources published after 1920. Only calorimetric measurements of heat capacities were compiled (see the brief characterization of experimental methods in Sec. 1.3.). Neither enthalpic measurements on reference-fluid boil-off calorimeters nor heat capacities determined by indirect techniques (compressibility and piezothermic methods) were considered.

The substantial part of heat capacity data discussed below are sub or superambient measurements carried out usually on adiabatic heat capacity calorimeters over a considerable temperature range. Near ambient conditions, the measurements performed over a limited temperature range or at one temperature only (usually at 298.15 K) are common for C_1 to C_6 1-alkanols. The latter data were typically determined during thermodynamic investigation on mixtures, as the values at the limit of a concentration range.

We did not pay special attention to the problems of solid-liquid phase transition for 1-alkanols; some compounds tend to form glasses and their melting points are not well defined. More information can be found in the literature (73WIL/ZVO, 85WIL/CHA).

Eighth column: the overall difference between the numbers of experimental points with positive and negative deviation from the recommended values (denoted +/−).

The parameters of polynomials describing individual subintervals of the temperature range of the selected data are listed in the lower part of the table. For C_1 to C_4 1-alkanols two sets of parameters are listed separately, the first relating to the temperature correlation of C_p and the second to that of C_{sat}. The meaning of the individual columns is as follows:

First column: temperature subinterval in kelvins to which the listed parameters relate.

Second to fifth columns: parameters of the cubic spline polynomial defined by Eq. (14) valid in the given subinterval. Dimension of parameters is $1/T^j$. Parameters for two to three subintervals are given except for 1-hexadecanol where the only literature source available contains parameters of a linear equation which are directly listed in the table.

Sixth column: level of accuracy assigned by the evaluators to the data generated from the polynomial in the given temperature subinterval. This characteristic expresses the expected overall accuracy of the recommended data and reflects both the uncertainty in the experimental values and possible error due to the fitting procedure. The following levels of accuracy were assigned:

I — excellent data (uncertainty below 0.1 percent)
II — highly reliable data (uncertainty below 0.25 percent)
III — reliable data (uncertainty below 0.5 percent)
IV — medium quality data (uncertainty below 1 percent)
V — data of low reliability (uncertainty below 3 percent)
VI — very unreliable data with a possibility of gross systematic errors (uncertainty above 3 percent).

The level of accuracy assigned to individual subintervals often differs due to the unequal reliability of experimental data in different parts of the temperature range. The lower accuracy for the high 1-alkanols in the upper temperature subinterval reflects the possibility of decomposition.

4.4. Recommended Values of Heat Capacities

Table 51 lists recommended heat capacities generated from the parameters of cubic spline polynomials at typical temperatures 273.15 and 298.15 K, and with the step 10 K over the whole temperature range of the selected experimental data. Both isobaric and saturation heat capacities are tabulated for C_1 to C_4 1-alkanols, no distinction between the two types of heat capacity is made for higher 1-alkanols. For C_{13} and higher 1-alkanols the heat capacity is practically constant over a temperature interval of several degrees near the upper temperature limit of the data. This is caused by a peculiar character of the Soviet data (80VAS/TRE, 82VAS/PET, see Sec. 3.3. for more details). They were difficult to fit; varying position and number of knots have never prevented their oscillation around the data generated from the cubic splines (see the deviation plots). As other independent studies are not available at the same conditions it is difficult to judge if this particular variation of the heat capacity is real (see also Fig. 18).

4.5. Parameters of Quasi-Polynomial Extrapolation Equation

The quasi-polynomial equation (17) permits semiquantitative extrapolation outside the temperature range of experimental values and obeys the condition of infinite heat capacity at the critical temperature (see Sec. 2.2. for details). Parameters are given for C_1 to C_{10} 1-alkanols in Table 52. This type of correlation was not carried out for higher 1-alkanols which decompose near the upper temperature limit of the experimental data. The parameters represent C_p for C_1 to C_4 1-alkanols; no distinction between the types of heat capacity is made for higher 1-alkanols. The tabulated items have the following meaning.

First line: name of 1-alkanol.

Second line: critical temperature in kelvins.

Third to ninth line: dimensionless parameters of Eq. (17).

Tenth line: the standard deviation of the fit s (defined by Eq. (7)) divided by gas constant R.

Eleventh line: level of accuracy within the temperature range of the experimental data. When using the equation outside this interval the accuracy deteriorates with the length of extrapolation.

4.6. Deviation Plots

An overview of the deviations from the recommended values for all experimental data (both included in and rejected from the final correlation) measured by various authors is presented in graphical form in the deviation plots. The temperature is plotted along the x-axis and the relative percentage deviation for individual data points along the y-axis. Data from different sources are distinguished by different symbols. Points that lie outside the range of the ordinate in the plot are accompanied by the numerical value of the deviation. Some points that overlap each other or the accompanying figures are omitted. Some data sets that exhibit large deviations from the recommended data were not included.

5. Tables

TABLE 1. Experimental heat capacities for methanol

Reference		Temp. range K	No. pnts.	Error %	Purity % method	Type capac	Calorimeter Type—Reference
25DRU/WEI		293.1	1	nosp	not specified	C_p	IP- 25DRU/WEI
25PAR		188.4–290.1	8	0.50	not specified	C_p	IP- 25PAR
29KEL1		181.1–292.0	14	1.00	not specified	C_p	IP- 29KEL1
29MIT/HAR		190.5–264.8	18	nosp	not specified	C_p	IP- 29MIT/HAR
31FIO/GIN	N	318.1–378.1	7	0.10	99.97 estim	C_{sat}	IP- 31FIO/GIN
39PHI		300.8	1	nosp	not specified	C_p	IP- 49WEI
49STA/GUP		180.0–270.0	10	0.50	not specified	C_p	AD- 49STA/GUP
49TSC/RIC2		298.1	1	nosp	not specified	C_p	IP- 49TSC/RIC1
50HOU/MAS		323.1–353.1	4	0.40	99.8 estim	C_p	AD- 50SAG/HOU
60SWI/ZIE	N	311.6	1	nosp	not specified	C_{avg}	DR- 58SWI/ZIE
62KAT		283.1–333.1	4	nosp	not specified	C_p	IP- 62KAT
66DRA/LAN	N	298.1	1	nosp	not specified	C_p	IP- 66DRA/LAN
68PAZ/REC	N	313.1	1	nosp	not specified	C_p	CT- 70PAZ/PAZ
71CAR/WES		180.0–320.0	17	nosp	99.975 melpt	C_p	AD- 53WES/HAT
71DES/BHA		298.1–318.1	3	1.00	not specified	C_p	IP- 56MUR/VAN
71GOP/GAM		308.0–333.0	eqn	1.00	not specified	C_p	AD- 71GOP/GAM
82BEN/DAR		288.1–308.1	2	nosp	not specified	C_p	FL- 71PIC/LED
82VIL/CAS		298.1	1	0.30	99.8 chrom	C_p	FL- 71PIC/LED
84ZEG/SOM		298.1	1	nosp	not specified	C_p	FL- 71PIC/LED
85COS/PAT		298.1–313.1	2	nosp	not specified	C_p	FL- 71PIC/LED
86KOR/KUK		278.0–298.0	2	0.20	not specified	C_p	AD- 83KUK/KOR
86OGA/MUR		298.1	1	0.10	not specified	C_p	FL- 85OGA
86TAN/TOY		298.1	1	0.30	99.96 anal	C_p	FL- 71PIC/LED
88AND/PAT		298.1	1	nosp	98. anal	C_p	FL- 71PIC/LED
88BOY/CRI	N	393.1–503.1	5	nosp	not specified	C_p	FL- 87LAN/CRI
88OKA/OGA	N	298.1–299.1	2	nosp	not specified	C_p	FL- 85OGA

31FIO/GIN data calculated using procedure by 85WIL/CHA
60SWI/ZIE average value over the temperature range 294–329 K
66DRA/LAN substance rated as pure, water content 0.08 per cent
68PAZ/REC the same data in 70PAZ/PAZ
88BOY/CRI original data measured at 8.3 MPa, converted to vapor pressure
88OKA/OGA water content less than 0.083 mol per cent

TABLE 2. Correlated heat capacities for methanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
31FIO/GIN	318.1–378.1	7	0.20#	1.732	3.61–2	0.35	−1.99–2	−3
71CAR/WES	180.0–320.0	17	0.10#	0.747	7.49–3	0.07	1.98–3	2
88BOY/CRI	393.1–503.1	5	3.00#	1.365	6.63–1	4.09	3.68–1	1

	d/R	d_r %	d_b/R	+/−		d/R	d_r %	d_b/R	+/−
					Rejected data				
25DRU/WEI	(1.94–1,	2.06,	−1.94–1,	−1)	25PAR	(2.64–2,	0.29,	9.36–3,	4)
29KEL1	(6.35–2,	0.74,	−5.39–2,	−12)	29MIT/HAR	(2.88–1,	3.13,	2.46–1,	16)
39PHI	(6.18–1,	5.93,	6.18–1,	1)	49STA/GUP	(6.19–2,	0.71,	−4.09–2,	−4)
49TSC/RIC2	(2.43–1,	2.43,	2.43–1,	1)	50HOU/MAS	(1.01–1,	0.90,	7.32–2,	2)
60SWI/ZIE	(3.62–1,	3.73,	−3.62–1,	−1)	62KAT	(7.12–1,	6.52,	6.92–1,	4)
66DRA/LAN	(1.57–1,	1.59,	1.57–1,	1)	68PAZ/REC	(1.95–1,	1.89,	1.95–1,	1)

TABLE 2. Correlated heat capacities for methanol — Continued

	d/R	d_r %	d_b/R	+/−		d/R	d_r %	d_b/R	+/−
				Rejected data					
71DES/BHA	(3.65−1,	3.51,	3.63−1,	3)	71GOP/GAM	(6.75−1,	6.94,	−6.63−1,	−3)
82BEN/DAR	(6.35−2,	0.64,	1.39−2,	0)	82VIL/CAS	(9.84−2,	1.00,	9.84−2,	1)
84ZEG/SOM	(4.43−2,	0.45,	4.43−2,	1)	85COS/PAT	(1.15−1,	1.16,	−1.14−1,	−2)
86KOR/KUK	(5.87−2,	0.62,	5.36−2,	2)	86OGA/MUR	(9.88−2,	1.02,	−9.88−2,	−1)
86TAN/TOY	(5.51−2,	0.56,	5.51−2,	1)	88AND/PAT	(1.04−1,	1.07,	−1.04−1,	−1)
88OKA/OGA	(9.04−2,	0.93,	−9.04−2,	−2)					

TABLE 3. Parameters of cubic spline polynomials for methanol

Statistics							
Heat Cap. Type	No. pnts. total	No. pnts. used	s_w	s/R	s_r %	s_b/R	+/−
C_p	113	29	1.317	3.46−2	1.97	5.74−2	1
C_{sat}	113	29	1.316	3.10−2	1.92	5.99−2	0

Parameters					
Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
180.00–300.00	1.11402+1	−2.60664	5.13952−1	6.85976−2	I
300.00– 400.00	7.43934	1.09424	−7.19673−1	2.05667−2	III
400.00– 503.15	−5.32666+2	4.06173+2	−1.01989+2	8.64481	VI
180.00– 300.00	1.12658+1	−2.77115	5.84730−1	5.85928−2	I
300.00– 400.00	8.64423	−1.49545−1	−2.89140−1	1.55689−1	III
400.00– 503.15	−3.04102+2	2.34410+2	−5.89291+1	5.04235	VI

TABLE 4. Experimental heat capacities for ethanol

Reference		Temp. range K	No. pnts.	Error %	Purity % method	Type capac	Calorimeter Type-Reference
20GIB/PAR		196.2–271.4	11	nosp	not specified	C_p	IP- 20GIB/LAT
24WIL/DAN		300.0–332.0	eqn	nosp	not specified	C_p	AD- 24WIL/DAN
25PAR	N	160.0–298.0	7	0.50	not specified	C_p	IP- 25PAR
29KEL2		163.5–294.3	20	1.00	99.96 estim	C_p	IP- 29KEL1
29MIT/HAR		184.4–268.8	25	nosp	not specified	C_p	IP- 29MIT/HAR1
31BLA/LEI	N	303.1–343.1	9	3.00	not specified	C_p	IP- 31BLA/LEI
31FIO/GIN		318.1–378.1	8	0.10	not specified	C_{sat}	IP- 31FIO/GIN
36ERN/WAT		298.1	1	nosp	not specified	C_p	IP- 49WEI
39BYK		298.1	1	nosp	not specified	C_p	IP- 39BYK
49TSC/RIC2		298.1	1	nosp	not specified	C_p	IP- 49TSC/RIC1
60SWI/ZIE	N	316.5	1	nosp	not specified	C_{avg}	DR- 58SWI/ZIE1

TABLE 4. Experimental heat capacities for ethanol — Continued

Reference		Temp. range K	No. pnts.	Error %	Purity % method	Type capac	Calorimeter Type-Reference
62RAB/NIK		288.1–328.1	9	0.30	not specified	C_p	AD- 47SKU
65KAU/BIT		293.1–349.1	11	1.0	not specified	C_p	FL- 65KAU/BIT
66HWA/ZIE		165.3–304.2	41	nosp	99.95 chrom	C_p	AD- 45SCO/MEY
66KLE		293.1–343.1	11	0.10	not specified	C_p	AD- 66KLE
67GRA		308.1–338.1	6	1.00	not specified	C_p	IP- 67GRA
67NIK/RAB		160.0–250.0	19	0.20	not specified	C_p	AD- 56POP/KOL
68PAZ/REC	N	313.1	1	nosp	not specified	C_p	CT- 70PAZ/PAZ
75PED/KAY		300.8–344.2	16	nosp	not specified	C_p	IP- 75PED/KAY
76FOR/BEN1		298.1	1	0.30	not specified	C_p	FL- 71PIC/LED
76FOR/BEN2		298.1	1	0.30	not specified	C_p	FL- 71PIC/LED
77HAI/SUG		161.3–301.1	54	nosp	99.86 melpt	C_{sat}	AD- 65SUG/SEK
78BYV/JAS		293.1–333.1	3	2.00	not specified	C_p	CT- 78BYV/JAS
79BRO/ZIE		159.0–306.0	eqn	nosp	99.94 melpt	C_p	AD- 45SCO/MEY
82BEN/DAR		288.1–308.1	2	0.30	not specified	C_p	FL- 71PIC/LED
82VIL/CAS		298.1	1	0.30	not specified	C_p	FL- 71PIC/LED
84STE/OLS		266.1–318.1	11	nosp	not specified	C_p	DS- 69PER/COM
84ZEG/SOM		298.1	1	0.30	not specified	C_p	FL- 71PIC/LED
85OGA		298.1	1	0.20	not specified	C_p	FL- 85OGA
86KOR/KUK		298.0	1	0.20	not specified	C_p	AD- 83KUK/KOR
86OGA/MUR		298.1	1	0.10	not specified	C_p	FL- 85OGA
86TAN/TOY		298.1	1	0.30	99.96 anal	C_p	FL- 71PIC/LED
88AND/PAT		298.1	1	nosp	98. anal	C_p	FL- 71PIC/LED

25PAR the same data in 27PAR/HUF
31FIO/GIN data calculated using procedure by 85WIL/CHA
60SWI/ZIE average value over the temperature range 294–339 K
68PAZ/REC the same data in 70PAZ/PAZ

TABLE 5. Correlated heat capacities for ethanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
31FIO/GIN	318.1–378.1	7	0.20#	1.087	3.80–2	0.22	−1.49–2	−5
66HWA/ZIE	165.3–304.2	41	0.10#	0.440	5.73–3	0.04	1.92–3	13
66KLE	293.1–343.1	11	0.10	2.051	2.87–2	0.21	−1.29–2	−4
68PAZ/REC	313.1	1	0.30#	0.159	6.82–3	0.05	−6.82–3	−1
76FOR/BEN1	298.1	1	0.30	0.575	2.32–2	0.17	−2.32–2	−1
76FOR/BEN2	298.1	1	0.30	0.156	6.35–3	0.05	6.35–3	1
77HAI/SUG	163.1–301.1	53	0.10#	0.720	8.72–3	0.07	2.26–3	5
79BRO/ZIE	159.0–305.7	10	0.20#	0.664	1.50–2	0.13	−1.36–2	−10
86OGA/MUR	298.1	1	0.10	0.647	8.75–3	0.06	8.75	−3

	d/R	d_r %	d_b/R	+/−		d/R	d_r %	d_b/R	+/−
				Rejected data					
20GIB/PAR	(1.60–1,	1.50,	−1.32–1,	−9)	24WIL/DAN	(4.75–1,	3.01,	3.81–1,	3)
25PAR	(7.27–2,	0.55,	4.79–2,	3)	29KEL2	(8.13–2,	0.72,	−5.67–2,	−16)
29MIT/HAR	(5.35–1,	4.46,	5.15–1,	25)	31BLA/LEI	(7.79–1,	4.74,	6.94–1,	9)
36ERN/WAT	(1.08,	8.68,	−1.08,	−1)	39BYK	(5.90–2,	0.44,	−5.90–2,	−1)
49TSC/RIC2	(4.51–1,	3.23,	4.51–1,	1)	60SWI/ZIE	(1.50–1,	1.05,	−1.50–1,	−1)
62RAB/NIK	(8.45–2,	0.60,	3.37–2,	3)	65KAU/BIT	(1.50–1,	1.07,	1.34–2,	5)
67GRA	(8.73–2,	0.61,	−5.16–2,	−4)	67NIK/RAB	(6.76–2,	0.64,	−6.05–2,	−19)
75PED/KAY	(2.32–1,	1.48,	1.96–1,	14)	78BYV/JAS	(6.22–1,	4.34,	−3.37–1,	−1)
82BEN/DAR	(1.21–1,	0.87,	5.18–2,	0)	82VIL/CAS	(1.76–1,	1.29,	1.76–1,	1)
84STE/OLS	(3.98–1,	2.85,	3.90–1,	11)	84ZEG/SOM	(4.60–2,	0.34,	4.60–2,	1)
85OGA	(2.14–1,	1.61,	−2.14–1,	−1)	86KOR/KUK	(6.88–2,	0.51,	6.88–2,	1)
86TAN/TOY	(4.72–2,	0.35,	4.72–2,	1)	88AND/PAT	(9.11–2,	0.68,	−9.11–2,	−1)

TABLE 6. Parameters of cubic spline polynomials for ethanol

Statistics							
Heat Cap. Type	No. pnts. total	No. pnts. used	s_w	s/R	s_r %	s_b/R	+/−
C_p	279	126	0.892	1.51-2	0.11	−1.60-3	0
C_{sat}	279	126	0.891	1.51-2	0.11	−1.58-3	−1

Parameters					
Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
159.00- 220.00	1.09275+1	9.77957−2	−7.38461−1	3.32071−1	I
220.00- 290.00	9.80965	1.62210	−1.43132	4.37050−1	I
290.00- 378.15	2.50266+1	−1.41196+1	3.99683	−1.86876−1	II
159.00- 220.00	1.08906+1	1.53924−1	−7.66644−1	3.36745−1	I
220.00- 290.00	9.86064	1.55832	−1.40500	4.33465−1	I
290.00- 378.15	2.63338+1	−1.54828+1	4.47125	−2.41965−1	II

TABLE 7. Experimental heat capacities for 1-propanol

Reference		Temp. range K	No. pnts.	Error %	Purity % method	Type capac	Calorimeter Type-Reference
20GIB/PAR		165.7-274.6	29	nosp	not specified	C_p	IP- 20GIB/LAT
26PAR/HUF		152.1-275.0	7	nosp	not specified	C_p	IP- 25PAR
27PAR/HUF		169.1-275.3	7	nosp	not specified	C_p	IP- 25PAR
29MIT/HAR		162.8-274.4	35	nosp	not specified	C_p	IP- 29MIT/HAR
39PHI		301.1	1	nosp	not specified	C_p	IP- 49WEI
41ZHD		279.6-318.8	5	nosp	not specified	C_p	DC- 34KOL/UDO
49TSC/RIC2		298.1	1	nosp	not specified	C_p	IP- 49TSC/RIC$_1$
51EUC/EIG		273.0-393.0	12	nosp	not specified	C_{sat}	AD- 51EUC/EIG
60SWI/ZIE	N	320.9	1	nosp	not specified	C_{avg}	DR- 58SWI/ZIE
68COU/LEE		153.9-361.5	47	0.10	99.75 melpt	C_p	AD- 63AND/COU
68PAZ/REC	N	313.1	1	nosp	not specified	C_p	CT- 70PAZ/PAZ
68REC1	N	298.0-313.0	eqn	nosp	not specified	C_p	AD- 68REC1
76FOR/BEN1		298.1-298.1	2	0.30	not specified	C_p	FL- 71PIC/LED
76FOR/BEN2		298.1	1	0.30	not specified	C_p	FL- 71PIC/LED
77MUR/SUB		298.1	1	0.30	not specified	C_p	IP- 64MOE/THO
79GRI/YAN	N	303.4-463.0	11	0.90	not specified	C_p	AD- 75RAS/GRI
80KAL/JED		181.8-303.1	66	0.20	99.95 chrom	C_p	AD- 80KAL/JED
81ARU/BAG		293.1-353.1	4	1.50	99.0 melpt	C_p	DC- 81ARU
82BEN/DAR		288.1-308.1	2	0.30	not specified	C_p	FL- 71PIC/LED
82VIL/CAS		298.1	1	0.30	not specified	C_p	FL- 71PIC/LED
84ZEG/SOM		298.1	1	0.30	not specified	C_p	FL- 71PIC/LED
86KOR/KUK		278.0-298.0	2	0.20	not specified	C_p	AD- 83KUK/KOR
86TAN/TOY		298.1	1	0.30	99.9 anal	C_p	FL- 71PIC/LED

60SWI/ZIE average value over the temperature range 294-347 K
68PAZ/REC the same data in 70PAZ/PAZ
68REC1 the same data in 68REC2 and 68REC3
79GRI/YAN data above 343.3 K were measured at superambient pressures up to 1.52 MPa

TABLE 8. Correlated heat capacities for 1-propanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
51EUC/EIG	353.0–393.0	5	1.50#	0.899	3.02−1	1.35	−2.52−1	−3
68COU/LEE	153.9–361.5	47	0.10	1.227	2.18−2	0.12	2.18−3	2
76FOR/BEN1	298.1	2	0.30	0.349	1.81−2	0.10	1.64−2	2
76FOR/BEN2	298.1	1	0.30	0.021	1.08−3	0.01	1.08−3	0
79GRI/YAN	303.4–463.0	11	0.90	0.805	1.97−1	0.72	−3.58−2	−5
80KAL/JED	181.8–303.1	63	0.20	0.626	1.85−2	0.13	−5.93−3	−14
86TAN/TOY	298.1	1	0.30	0.229	1.19−2	0.07	1.19−2	1

	d/R	d_r %	d_b/R	+/−		d/R	d_r %	d_b/R	+/−
				Rejected data					
20GIB/PAR	(1.03-1,	0.74,	2.14-2,	7)	26PAR/HUF	(1.26-1,	0.83,	1.17-1,	5)
27PAR/HUF	(1.21-1,	0.83,	1.16-1,	7)	29MIT/HAR	(7.89-1,	5.22,	7.30-1,	31)
39PHI	(2.30,	11.61,	2.30,	1)	41ZHD	(4.09-1,	2.17,	3.49-1,	5)
49TSC/RIC2	(5.70-1,	3.19,	5.70-1,	1)	60SWI/ZIE	(2.85-1,	1.52,	−2.85-1,	−1)
68PAZ/REC	(6.96-1,	3.65,	6.96-1,	1)	68REC1	(1.96-1,	1.10,	4.83-2,	1)
77MUR/SUB	(6.18-1,	3.45,	6.18-1,	1)	81ARU/BAG	(2.75-1,	1.39,	−2.12-1,	−2)
82BEN/DAR	(1.85-1,	1.01,	1.27-1,	0)	82VIL/CAS	(3.63-1,	2.06,	3.63-1,	1)
84ZEG/SOM	(6.96-2,	0.40,	6.96-2,	1)	86KOR/KUK	(8.74-2,	0.52,	8.65-2,	2)

TABLE 9. Parameters of cubic spline polynomials for 1-propanol

Statistics

Heat Cap. Type	No. pnts. total	No. pnts. used	s_w	s/R	s_r %	s_b/R	+/−
C_p	241	130	0.927	9.01-2	0.38	−1.49-2	−18
C_{sat}	241	130	0.929	8.64-2	0.37	−1.45-2	−17

Parameters

Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
153.93- 260.00	9.57693	5.29059	−3.33096	8.15349−1	I
260.00- 330.00	2.47842+1	−1.22562+1	3.41780	−4.98774−2	I
330.00- 463.00	1.33110+2	−1.10734+2	3.32595+1	−3.06419	IV
153.93- 260.00	9.54635	5.33584	−3.35286	8.18814−1	I
260.00- 330.00	2.51040+1	−1.26154+1	3.55145	−6.63536−2	I
330.00- 463.00	1.37956+2	−1.15208+2	3.46402+1	−3.20663	IV

TABLE 10. Experimental heat capacities for 1-butanol

Reference		Temp. range K	No. pnts.	Error %	Purity %	method	Type capac	Calorimeter Type-Reference
24WIL/DAN		303.0–348.0	eqn	nosp	not specified		C_p	AD- 24WIL/DAN
25PAR		194.6–294.0	12	0.50	not specified		C_p	IP- 25PAR
33TRE/WAT		298.1	1	nosp	not specified		C_p	IP- 49WEI
38PAN/DUD	N	298.0–363.0	eqn	nosp	not specified		C_p	not specified
39PHI		302.5	1	nosp	not specified		C_p	IP- 49WEI
49TSC/RIC2		298.1	1	nosp	not specified		C_p	IP- 49TSC/RIC1
60SWI/ZIE	N	322.4	1	nosp	not specified		C_{avg}	DR- 58SWI/ZIE
65COU/HAL		188.2–322.3	25	0.20	99.94	melpt	C_p	AD- 63AND/COU
67GRA		308.1–338.1	4	1.00	not specified		C_p	IP- 67GRA
68PAZ/REC	N	301.1–313.1	2	nosp	not specified		C_p	CT- 70PAZ/PAZ
75SAN	N	295.9–466.6	20	0.90	not specified		C_p	FL- 75SAN
78BYV/JAS		293.1–333.1	3	2.00	not specified		C_p	CT- 78BYV/JAS
79GRI/YAN	N	324.0–462.5	8	0.90	not specified		C_p	AD- 75RAS/GRI
81ARU/BAG		293.1–373.1	5	1.50	not specified		C_p	DC- 81ARU
86GAT/WOO		298.1–368.1	4	nosp	99.	anal	C_p	DS- 83BEN/MER
86KOR/KUK		278.0–298.0	2	0.20	not specified		C_p	AD- 83KUK/KOR
86NAZ/BAS1		321.0–373.4	3	2.00	not specified		C_p	RI- 86NAZ/BAS1
86OGA/MUR		298.1	1	0.10	not specified		C_p	FL- 85OGA
86ROU/GRO		298.1	1	nosp.	99.	anal	C_p	FL- 71PIC/LAD
86TAN/TOY		298.1	1	0.30	99.9	anal	C_p	FL- 71PIC/LED
88AND/PAT		298.1	1	nosp	98.	anal	C_p	FL- 71PIC/LED
88PIE/SOM		298.1	1	nosp	not specified		C_p	FL- 71PIC/LED

38PAN/DUD temperature range of parameters validity estimated by the compiler
60SWI/ZIE average value over temperature range 294–350 K
68PAZ/REC the same data as in 70PAZ/PAZ; value at 313.15 K is apparently wrong
75SAN isobaric heat capacities at pressure about 1.4 MPa
79GRI/YAN data above 363.6 K were measured at superambient pressures up to 0.92 MPa

TABLE 11. Correlated heat capacities for 1-butanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
65COU/HAL	188.2–322.3	25	0.20	0.830	3.48-2	0.17	3.50-3	-2
68PAZ/REC	301.1	1	0.30#	0.422	2.73-2	0.13	2.73-2	1
75SAN	295.9–466.6	19	0.90	1.078	2.79-1	0.97	−4.99-4	−2
79GRI/YAN	324.0–462.5	8	0.90	0.781	2.28-1	0.70	1.09-1	4
86GAT/WOO	298.1–368.1	4	0.30#	1.032	7.30-2	0.31	−5.26-2	−2
86OGA/MUR	298.1	1	0.10	0.095	2.03-3	0.01	2.03-3	0
86TAN/TOY	298.1	1	0.30	0.893	5.69-2	0.27	−5.69-2	−1
88AND/PAT	298.1	1	0.30#	0.571	3.65-2	0.17	−3.65-2	−1
88PIE/SOM	298.1	1	0.30#	0.156	1.00-2	0.05	−1.00-2	−1

	d/R	d_r %	d_b/R	+/−		d/R	d_r %	d_b/R	+/−
				Rejected data					
24WIL/DAN	(1.03-1,	0.43,	2.44-2,	2)	25PAR	(8.07-2,	0.40,	4.39−2,	6)
33TRE/WAT	(7.37-1,	3.34,	7.37-1,	1)	38PAN/DUD	(1.37,	5.67,	1.07,	3)
39PHI	(4.23,	16.32,	4.23,	1)	49TSC/RIC2	(8.86-1,	3.99,	8.86−1,	1)
60SWI/ZIE	(8.35-1,	3.67,	−8.35-1,	−1)	67GRA	(2.89-1,	1.23,	−2.59−1,	−4)
78BYV/JAS	(2.15,	10.11,	−1.84,	−3)	81ARU/BAG	(3.71-1,	1.50,	−3.14−1,	−3)
86KOR/KUK	(1.17-1,	0.58,	1.12-1,	2)	86NAZ/BAS1	(8.71-1,	3.31,	−8.03−1,	−3)
86ROU/GRO	(1.44-1,	0.68,	−1.44-1,	-1)					

TABLE 12. Parameters of cubic spline polynomials for 1-butanol

Heat Cap. Type	No. Pnts Total	No. Pnts Used	s_w	s/R	s_r %	s_b/R	+/−
			Statistics				
C_p	106	61	0.952	1.89-1	0.65	1.10-2	−4
C_{sat}	106	61	0.951	1.88-1	0.65	1.09-2	−4

Parameters

Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
188.22- 293.00	6.76094	1.27141+1	−6.50730	1.30119	I
293.00- 363.00	1.34385+2	−1.17959+2	3.80911+1	−3.77257	III
363.00- 466.63	−1.32680+1	4.06820	4.47474	−6.85669-1	IV
188.22- 293.00	6.74763	1.27313+1	−6.51457	1.30221	I
293.00- 363.00	1.34985+2	−1.18570+2	3.82981+1	−3.79593	III
363.00- 466.63	−6.08726	−1.98117	6.18000	−8.46610-1	IV

Table 13. Experimental heat capacities for 1-pentanol

Reference		Temp. range K	No. pnts	Error %	Purity % method	Type Capac	Calorimeter Type-Reference
33PAR/HUF		204.1-298.0	6	1.00	not specified	C_p	IP- 25PAR
39PHI		302.4	1	nosp	not specified	C_p	IP- 49WEI
49LEE		313.0-343.0	eqn	nosp	not specified	C_p	CC- 33FER/MIL
49TSC/RIC2		298.1	1	nosp	not specified	C_p	IP- 49TSC/RIC1
68COU/LEE		205.1-389.1	53	0.15	99.87 melpt	C_p	AD- 63AND/COU
68PAZ/REC	N	313.1	1	nosp	not specified	C_p	CT- 70PAZ/PAZ
76SKO/SUU		298.1	1	0.10	not specified	C_p	DR- 71KON/SUU
79GRI/YAN	N	301.3-463.4	9	0.90	not specified	C_p	AD- 75RAS/GRI
81ARU/BAG		293.1-393.1	6	1.50	not specified	C_p	DC- 81ARU
83DAP/DEL		288.1-298.1	2	0.30	not specified	C_p	FL- 71PIC/LED
86BEN/DAR		298.1	1	0.30	not specified	C_p	FL- 71PIC/LED
86TAN/TOY		298.1	1	0.30	98. anal	C_p	FL- 71PIC/LED

68PAZ/REC the same data in 70PAZ/PAZ
79GRI/YAN data above 382.7 K were measured at superambient pressures up to 0.81 MPa

TABLE 14. Correlated heat capacities for 1-pentanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
68COU/LEE	205.1-389.1	53	0.15	0.386	1.41−2	0.06	−1.97−3	−4
76SKO/SUU	298.1	1	0.10	1.229	3.08−2	0.12	3.08−2	1
79GRI/YAN	301.3-463.4	9	0.90	0.697	2.00−1	0.63	1.41−1	5
86TAN/TOY	298.1	1	0.30	0.074	5.56−3	0.02	5.56−3	1

	d/R	d_r %	d_b/R	+/−		d/R	d_r %	d_b/R	+/−
				Rejected data					
33PAR/HUF	(7.74−2,	0.31,	6.67−2,	5)	39PHI	(1.18,	4.87,	−1.18,	−1)
49LEE	(1.68+1,	37.34,	1.68+1,	5)	49TSC/RIC2	(6.94−1,	2.70,	6.94−1,	1)
68PAZ/REC	(2.35,	8.12,	2.35,	1)	81ARU/BAG	(3.93−1,	1.36,	−2.93−1,	−4)
83DAP/DEL	(7.88−2,	0.32,	−7.37−2,	−2)	86BEN/DAR	(8.34−2,	0.33,	−8.34−2,	−1)

TABLE 15. Parameters of Cubic Spline Polynomials for 1-Pentanol

Statistics							
Heat Cap. Type	No. pnts. total	No. pnts. used	s_w	s/R	s_r %	s_b/R	+/−
C	87	64	0.488	8.01−2	0.25	1.88−2	3

Parameters					
Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
205.12- 295.00	1.17769+1	1.06001+1	−5.86915	1.27629	I
295.00- 380.00	1.62503+2	−1.42681+2	4.60905+1	−4.59485	I
380.00- 463.36	−2.84080+2	2.09885+2	−4.66900+1	3.54379	V

TABLE 16. Experimental heat capacities for 1-hexanol

Reference		Temp. range K	No. pnts.	Error %	Purity % method	Type capac	Calorimeter Type-Reference
29KEL2		229.6-290.0	7	1.00	not specified	C_p	IP- 29KEL1
59HUT/BAI		298.1	1	nosp	not specified	C_p	AD- 55HUT/MAN
73KAL/WOY		303.1	1	nosp	not specified	C_p	IP- 70REC
79GRI/YAN	N	303.7-462.0	9	0.90	not specified	C_p	AD- 75RAS/GRI
81ARU		293.1-393.1	6	1.50	not specified	C_p	DC- 81ARU
83BEN/DAR		298.1	1	0.30	not specified	C_p	FL- 71PIC/LED
84BRA/PIN		298.1	1	nosp	99. melpt	C_p	FL- 71PIC/LED
84KAL/WOY		229.1-300.6	35	nosp	99.9 chrom	C_p	AD- 80KAL/JED
85COS/PAT		283.1-313.1	3	0.30	98. estim	C_p	FL- 71PIC/LED
86TAN/TOY		298.1	1	0.30	98. anal	C_p	FL- 71PIC/LED
88AND/PAT		298.1	1	nosp	98. anal	C_p	FL- 71PIC/LED
89VES/BAR	N	298.1-318.1	5	0.50	not specified	C_p	AD- 79VES/ZAB

79GRI/YAN data above 385.4 K were measured at superambient pressures up to 0.74 MPa

89VES/BAR water content 0.04 mass per cent

TABLE 17. Correlated Heat capacities for 1-Hexanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
29KEL2	229.6–290.0	7	1.00	1.344	3.41-1	1.34	−1.95-1	−5
79GRI/YAN	303.7–462.0	9	0.90	0.458	1.44-1	0.41	5.02-2	3
83BEN/DAR	298.1	1	0.30	0.298	2.58-2	0.09	2.58-2	1
84BRA/PIN	298.1	1	0.30#	1.134	9.80-2	0.34	−9.80-2	−1
84KAL/WOY	229.1–300.6	35	3.50#	0.960	9.00-1	3.36	8.93-1	35
85COS/PAT	283.1–313.1	3	0.30	1.611	1.43-1	0.48	−1.35-1	−3
86TAN/TOY	298.1	1	0.30	0.187	1.62-2	0.06	1.62-2	1
88AND/PAT	298.1	1	0.30#	1.222	1.06-1	0.37	1.06-1	1
89VES/BAR	298.1–318.1	5	0.50	1.096	1.62-1	0.55	1.27-1	4

	d/R	d_r %	d_b/R	+/−		d/R	d_r %	d_b/R	+/−
				Rejected data					
59HUT/BAI	(3.19-1,	1.09,	3.19-1,	1)	73KAL/WOY	(3.66-1,	1.22,	3.66-1,	1)
81ARU	(4.94-1,	1.36,	−1.41-1,	−2)					

TABLE 18. Parameters of cubic spline polynomials for 1-hexanol

Statistics							
Heat Cap. Type	No. pnts. total	No. pnts. used	s_w	s/R	s_r %	s_b/R	+/−
C	71	63	1.055	7.20-1	2.69	4.86-1	36

Parameters					
Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
229.14– 290.00	−5.41058+1	8.83289+1	−3.51120+1	4.97293	IV
290.00– 360.00	2.42829+2	−2.18845+2	7.08100+1	−7.20201	IV
360.00– 462.03	−1.81033+2	1.34373+2	−2.73061+1	1.88281	V

TABLE 19. Experimental heat capacities for 1-heptanol

Reference		Temp. range K	No. pnts.	Error %	Purity % method	Type capac	Calorimeter Type-Reference
56PAR/KEN		240.0–300.0	7	1.00	98.2 melpt	C_p	IP- 25PAR
59HUT/BAI		298.1	1	nosp	not specified	C_p	AD- 55HUT/MAN
67GRA		308.1–338.1	4	1.00	not specified	C_p	IP- 67GRA
79GRI/YAN	N	303.0–462.3	9	0.90	not specified	C_p	AD- 75RAS/GRI
80VAS/TRE		323.0–453.0	eqn	2.00	99.8 anal	C_{sat}	AD- 80VAS/TRE
88AND/PAT		298.1	1	nosp	98. anal	C_p	FL- 71PIC/LED
88NAZ/BAS		303.4–447.1	7	2.20	99.2 anal	C_p	RP- 86NAZ/BAS1
89VES/BAR	N	298.1–318.1	5	0.50	not specified	C_p	AD- 79VES/ZAB

79GRI/YAN data above 425.2 K were measured at superambient pressures up to 0.27 MPa

89VES/BAR water content 0.007 mass per cent

TABLE 20. Correlated heat capacities for 1-heptanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
56PAR/KEN	240.0–300.0	7	1.00	1.190	3.87–1	1.19	1.51–1	1
59HUT/BAI	298.1	1	0.50#	0.808	1.33–1	0.40	1.33–1	1
79GRI/YAN	303.0–462.3	9	0.90	0.458	1.61–1	0.41	7.75–2	5
88AND/PAT	298.1	1	0.30#	0.218	2.15–2	0.07	2.15–2	1
89VES/BAR	298.1–318.1	5	0.50	0.808	1.38–1	0.40	−1.29–1	−5

	d/R	d_r %	d_b/R	+/−		d/R	d_r %	d_b/R	+/−
				Rejected data					
67GRA	(8.64–1,	2.48,	−8.56–1,	−4)	80VAS/TRE	(1.00,	2.47,	−9.62–1,	−14)
88NAZ/BAS	(1.43,	3.73,	1.83–1,	1)					

TABLE 21. Parameters of cubic spline polynomials for 1-heptanol

Statistics							
Heat Cap. Type	No. pnts. total	No. pnts. used	s_w	s/R	s_r %	s_b/R	+/−
C	48	23	0.963	2.87–1	0.85	5.51–2	3

Parameters					
Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
240.00– 300.00	−2.33938+2	2.82773+2	−1.03216+2	1.28701+1	IV
300.00– 360.00	4.55134+2	−4.06299+2	1.26474+2	−1.26511+1	IV
360.00– 462.31	−2.77526+2	2.04251+2	−4.31228+1	3.05233	V

TABLE 22. Experimental heat capacities for 1-octanol

Reference	Temp. range K	No. pnts.	Error %	Purity % method	Type capac	Calorimeter Type-Reference
31CLI/AND	246.0–286.0	4	nosp	not specified	C_{sat}	DR- 26AND/LYN
59HUT/BAI	298.1	1	nosp	not specified	C_p	AD- 55HUT/MAN
61ROU	298.9–311.3	5	nosp	not specified	C_p	AD- 61ROU
79GRI/YAN	310.7–452.3	8	0.90	not specified	C_p	AD- 75RAS/GRI
80VAS/TRE	313.0–468.0	eqn	2.00	99.6 anal	C_{sat}	AD- 80VAS/TRE
86NAZ/BAS2	303.2–448.6	7	2.00	99.6 estim	C_p	RP- 86NAZ/BAS1
89VES/BAR N	298.1–318.1	5	0.50	not specified	C_p	AD- 79VES/ZAB

89VES/BAR water content 0.039 mass per cent

TABLE 23. Correlated heat capacities for 1-octanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
31CLI/AND	246.0–273.1	3	1.50#	0.646	3.17–1	0.97	−1.97–1	−1
61ROU	298.9–311.3	5	0.50#	1.008	1.88–1	0.50	1.50–1	3
79GRI/YAN	310.7–452.3	8	0.90	0.375	1.61–1	0.34	5.39–2	4
89VES/BAR	298.1–318.1	5	0.50	0.872	1.67–1	0.44	−1.59–1	−5

	d/R	d_r %	d_b/R	+/−		d/R	d_r %	d_b/R	+/−
				Rejected data					
59HUT/BAI	(9.37−1,	2.49,	9.37−1,	1)	80VAS/TRE	(7.20−1,	1.59,	−6.59–1,	−14)
86NAZ/BAS2	(1.47,	3.36,	9.14−2,	−1)					

TABLE 24. Parameters of cubic spline polynomials for 1-octanol

Statistics							
Heat Cap. Type	No. pnts. total	No. pnts. used	s_w	s/R	s_r %	s_b/R	+/−
C	51	21	0.867	2.35–1	0.63	−9.74–3	1

Parameters					
Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
246.00– 300.00	−7.91423+2	8.44569+2	−2.90774+2	3.37629+1	V
300.00– 360.00	4.78605+2	−4.25459+2	1.32568+2	−1.32752+1	IV
360.00– 452.29	−2.87499+2	2.12961+2	−4.47706+1	3.14507	V

TABLE 25. Experimental heat capacities for 1-nonanol

Reference	Temp. range K	No. pnts.	Error %	Purity % method	Type capac	Calorimeter Type-Reference
79GRI/YAN	304.2–464.2	10	0.90	not specified	C_p	AD- 75RAS/GRI
82VAS/PET	303.0–423.0	eqn	nosp	99.2 anal	C_{sat}	AD- 80VAS/TRE
82VAS/PET	423.0–483.0	eqn	nosp	99.2 anal	C_{sat}	AD- 80VAS/TRE
86NAZ/BAS2	303.1–474.1	8	2.00	99.4 estim	C_p	RP- 86NAZ/BAS1

TABLE 26. Correlated Heat capacities for 1-Nonanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
79GRI/YAN	304.2–464.2	10	1.00	0.193	9.24–2	0.19	3.21–4	2

	d/R	d_r %	d_b/R	+/−		d/R	d_r %	d_b/R	+/−
				Rejected data					
82VAS/PET	(6.05−2,	1.21,	2.42−1,	2)	82VAS/PET	(8.39−1,	1.50,	8.09−1,	5)
86NAZ/BAS	(1.52,	3.02,	−8.17−1,	−2)					

TABLE 27. Parameters of cubic spline polynomials for 1-nonanol

Statistics							
Heat Cap. Type	No. pnts. total	No. pnts. used	s_w	s/R	s_r %	s_b/R	+/−
C	38	10	0.272	1.31–1	0.27	3.21–4	2

Parameters					
Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
304.17– 380.00	2.95850+2	−2.63858+2	8.58446+1	−8.75264	IV
380.00– 464.24	−6.83055+2	5.08962+2	−1.17529+2	9.08715	IV

TABLE 28. Experimental heat capacities for 1-decanol

Reference	Temp. range K	No. pnts.	Error %	Purity % method	Type capac	Calorimeter Type-Reference
67GRA	308.1–338.1	4	1.00	not specified	C_p	IP- 67GRA
75WOY/KAL	303.1	1	nosp	not specified	C_p	IP- 70REC
79GRI/YAN	305.8–463.3	9	0.90	not specified	C_p	AD- 75RAS/GRI
79SVE	301.0–461.0	33	nosp	99.80 chrom	C_{sat}	DS- 69PER/COM
80VAS/TRE	323.0–403.0	eqn	2.00	99.2 anal	C_{sat}	AD- 80VAS/TRE
80VAS/TRE	403.0–503.0	eqn	2.00	99.2 anal	C_{sat}	AD- 80VAS/TRE
85COS/PAT	283.1–313.1	3	nosp	99. estim	C_p	FL- 71PIC/LED
88AND/PAT	298.1	1	nosp	98. anal	C_p	FL- 71PIC/LED
88NAZ/BAS	304.0–523.0	9	2.20	99.1 anal	C_p	RP- 86NAZ/BAS1

TABLE 29. Correlated heat capacities for 1-decanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
75WOY/KAL	303.1	1	0.30#	0.407	5.55-2	0.12	5.55-2	1
79GRI/YAN	305.8-463.3	9	0.90	1.251	6.45-1	1.13	4.92-1	5
79SVE	301.0-461.0	33	1.00#	0.380	2.11-1	0.38	−1.40-1	−23
80VAS/TRE	403.0-503.0	11	2.00	0.123	1.46-1	0.25	−5.01-2	−4
85COS/PAT	283.1-313.1	3	0.30#	1.027	1.41-1	0.31	−1.26-1	−3
88AND/PAT	298.1	1	0.30#	2.120	2.85-1	0.64	2.85-1	1

	d/R	d_r %	d_b/R	+/−		d/R	d_r %	d_b/R	+/−
				Rejected data					
67GRA	(1.68,	3.71,	−1.56,	−4)	80VAS/TRE	(5.97−1,	1.16,	−5.48−1,	−7)
88NAZ/BAS	(1.88,	3.15,	2.48−1,	−2)					

Table 30. Parameters of cubic spline polynomials for 1-decanol

Heat Cap. Type	No. pnts. total	No. pnts. used	s_w	s/R	s_r %	s_b/R	+/−
			Statistics				
C	80	58	0.712	3.25−1	0.58	−1.37-2	−23

Parameters

Temp. range	A_0 K	A_1	A_2	A_3	Level of accuracy
283.15- 393.00	1.58356+2	−1.34024+2	4.65302+1	−4.82249	IV
393.00- 503.00	−4.20453+2	3.07816+2	−6.58971+1	4.71333	IV

TABLE 31. Experimental heat capacities for 1-undecanol

Reference	Temp. range K	No. pnts.	Error %	Purity %	method	Type capac	Calorimeter Type-Reference
82VAS/PET	303.0-433.0	eqn	nosp	99.7	anal	C_{sat}	AD- 80VAS/TRE
82VAS/PET	433.0-523.0	eqn	nosp	99.7	anal	C_{sat}	AD- 80VAS/TRE
87NAZ/BAD	303.6-499.6	9	nosp	not specified		C_{sat}	RP- 86NAZ/BAS1
88AND/PAT	298.1	1	nosp	98.	anal	C_p	FL- 71PIC/LED

TABLE 32. Correlated heat capacities for 1-undecanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
82VAS/PET	303.0–433.0	14	2.00#	0.223	2.40–1	0.45	4.42–2	0
82VAS/PET	433.0–523.0	10	2.00#	0.136	1.79–1	0.27	1.95–2	−1
88AND/PAT	298.1	1	0.30#	0.119	1.74–2	0.04	−1.74–2	−1

	d/R	d_r %	d_b/R	+/−	d/R	d_r %	d_b/R	+/−
			Rejected data					
87NAZ/BAD	(2.92,	4.39,	1.72−3,	−3)				

Table 33. Parameters of cubic spline polynomials for 1-undecanol

Statistics							
Heat Cap. Type	No. pnts. total	No. pnts. used	s_w	s/R	s_r %	s_b/R	+/−
C	34	25	0.211	2.37−1	0.42	3.18–2	−2

Parameters					
Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
298.15– 420.00	−7.49134+1	6.40910+1	−8.09149	1.75215–1	V
420.00– 523.00	−2.31985+2	1.76285+2	−3.48043+1	2.29528	V

Table 34. Experimental heat capacities for 1-dodecanol

Reference	Temp. range K	No. pnts.	Error %	Purity %	method	Type capac	Calorimeter Type-Reference
79SVE	316.0–486.0	35	nosp	99.98	chrom	C_{sat}	DS- 69PER/COM
82VAS/PET	303.0–423.0	eqn	nosp	99.9	anal	C_{sat}	AD- 80VAS/TRE
82VAS/PET	423.0–533.0	eqn	nosp	99.9	anal	C_{sat}	AD- 80VAS/TRE
88AND/PAT	298.1	1	nosp	98.	anal	C_p	FL- 71PIC/LED

TABLE 35. Correlated heat capacities for 1-dodecanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
79SVE	316.0–486.0	35	1.00#	0.163	1.04–1	0.16	−1.56–3	−7
88AND/PAT	298.1	1	0.30#	0.037	5.93–3	0.01	5.93–3	1

	d/R	d_r %	d_b/R	+/−		d/R	d_r %	d_b/R	+/−
				Rejected data					
82VAS/PET	(2.60 ,	4.01,	2.58 ,	13)	82VAS/PET	(2.60,	3.68,	2.60,	7)

TABLE 36. Parameters of cubic spline polynomials for 1-dodecanol

Statistics							
Heat Cap. Type	No. pnts. total	No. pnts. used	s_w %	s/R	s_r	s_b/R	+/−
C	61	36	0.173	1.10–1	0.17	−1.35–3	−6

Parameters					
Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
298.15– 400.00	1.35874+2	−1.09452+2	3.99995+1	−4.24047	IV
400.00– 486.00	−5.48094+2	4.03524+2	−8.82445+1	6.44652	IV

TABLE 37. Experimental heat capacities for 1-tridecanol

Reference	Temp. range K	No. pnts.	Error %	Purity %	method	Type capac	Calorimeter Type-Reference
74MOS/MOU	312.0–346.0	eqn	nosp	99.95	chrom	C_p	AD- 74MOS/MOU
80VAS/TRE	333.0–413.0	eqn	2.00	99.2	anal	C_{sat}	AD- 80VAS/TRE
80VAS/TRE	413.0–463.0	eqn	2.00	99.2	anal	C_{sat}	AD- 80VAS/TRE
80VAS/TRE	463.0–573.0	eqn	2.00	99.2	anal	C_{sat}	AD- 80VAS/TRE

TABLE 38. Correlated heat capacities for 1-tridecanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
74MOS/MOU	305.0–345.0	9	0.50#	0.163	5.10–2	0.08	−9.88–3	1
80VAS/TRE	323.0–423.0	11	2.00	0.245	3.24–1	0.49	1.82–1	9
80VAS/TRE	423.0–553.0	14	2.00	0.186	2.77–1	0.37	−3.62–2	−2

TABLE 39. Parameters of cubic spline polynomials for 1-tridecanol

Statistics							
Heat Cap. Type	No. pnts. total	No. pnts. used	s_w	s/R	s_r %	s_b/R	+/−
C	34	34	0.219	2.79−1	0.40	4.14-2	8

Parameters					
Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
305.00- 398.00	2.74994+2	−2.20393+2	7.00074+1	−6.89863	V
398.00- 553.00	−4.97352+2	3.61777+2	−7.62666+1	5.35213	V

TABLE 40. Experimental heat capacities for 1-tetradecanol

Reference	Temp. range K	No. pnts.	Error %	Purity %	method	Type capac	Calorimeter Type-Reference
74MOS/MOU	312.0-346.0	eqn	nosp	99.95	chrom	C_p	AD- 74MOS/MOU
80VAS/TRE	333.0-413.0	eqn	2.00	99.2	anal	C_{sat}	AD- 80VAS/TRE
80VAS/TRE	413.0-463.0	eqn	2.00	99.2	anal	C_{sat}	AD- 80VAS/TRE
80VAS/TRE	463.0-573.0	eqn	2.00	99.2	anal	C_{sat}	AD- 80VAS/TRE

TABLE 41. Correlated heat capacities for 1-tetradecanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
Selected data								
74MOS/MOU	312.0-342.0	7	0.50#	0.106	3.48-2	0.05	−8.43-3	−2
80VAS/TRE	343.0-413.0	8	2.00	0.363	5.33-1	0.73	2.89-1	4
80VAS/TRE	413.0-463.0	6	2.00	0.275	4.29-1	0.55	−1.19-1	−2
80VAS/TRE	463.0-573.0	12	2.00	0.276	4.40-1	0.55	−4.19-2	−1

TABLE 42. Parameters of cubic spline polynomials for 1-tetradecanol

Statistics							
Heat Cap. Type	No. pnts. total	No. pnts. used	s_w	s/R	s_r %	s_b/R	+/−
C	34	33	0.299	4.51-1	0.59	3.13-2	−1

Parameters					
Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
312.00- 440.00	8.95398+1	−5.76851+1	2.36286+1	−2.52013	V
440.00- 573.00	−7.06941+2	4.85370+2	−9.97931+1	6.83000	V

TABLE 43. Experimental heat capacities for 1-pentadecanol

Reference	Temp. range K	No. pnts.	Error %	Purity %	method	Type capac	Calorimeter Type-Reference
74MOS/MOU	318.0–346.0	eqn	nosp	99.97	chrom	C_p	AD- 74MOS/MOU
82VAS/PET	333.0–413.0	eqn	nosp	99.4	anal	C_{sat}	AD- 80VAS/TRE
82VAS/PET	413.0–513.0	eqn	nosp	99.4	anal	C_{sat}	AD- 80VAS/TRE
82VAS/PET	513.0–583.0	eqn	nosp	99.4	anal	C_{sat}	AD- 80VAS/TRE

TABLE 44. Correlated heat capacities for 1-pentadecanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
74MOS/MOU	318.0–343.0	6	0.50#	0.528	1.82-1	0.26	−7.27-2	−2
82VAS/PET	333.0–413.0	9	2.00#	0.710	1.05	1.42	1.05	9
82VAS/PET	413.0–513.0	11	2.00#	0.385	6.18-1	0.77	−3.21-1	−5
82VAS/PET	513.0–583.0	8	2.00#	0.307	5.20-1	0.61	1.99-1	4

TABLE 45. Parameters of cubic spline polynomials for 1-pentadecanol

Statistics							
Heat Cap. Type	No. pnts. total	No. pnts. used	s_w	s/R	s_r %	s_b/R	+/−
C	34	34	0.544	7.56-1	0.98	2.07-1	6

Parameters					
Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
318.00- 450.00	1.05994+2	−6.22933+1	2.31068+1	−2.33241	V
450.00- 583.00	−7.23618+2	4.90782+2	−9.97988+1	6.77171	V

TABLE 46. Experimental heat capacities for 1-hexadecanol

Reference	Temp. range K	No. pnts.	Error %	Purity %	method	Type capac	Calorimeter Type-Reference
74MOS/MOU	323.0–346.0	eqn	nosp	99.96	chrom	C_p	AD- 74MOS/MOU

TABLE 47. Parameters of regression polynomial for 1-hexadecanol

Parameters					
Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
323.0- 346.0	−1.93936+1	2.76631+1			IV

TABLE 48. Experimental heat capacities for 1-octadecanol

Reference	Temp. range K	No. pnts.	Error %	Purity %	method	Type capac	Calorimeter Type-Reference
80VAS/TRE	353.0–413.0	eqn	2.00	99.8	anal	C_{sat}	AD- 80VAS/TRE
80VAS/TRE	413.0–513.0	eqn	2.00	99.8	anal	C_{sat}	AD- 80VAS/TRE
80VAS/TRE	513.0–623.0	eqn	2.00	99.8	anal	C_{sat}	AD- 80VAS/TRE

TABLE 49. Correlated heat capacities for 1-octadecanol

Reference	Temp. range K	No. pnts. used	$\sigma_r C$ %	d_w	d/R	d_r %	d_b/R	+/−
			Selected data					
80VAS/TRE	353.0–413.0	7	2.00	0.097	1.78−1	0.19	−7.90−2	−5
80VAS/TRE	413.0–513.0	11	2.00	0.086	1.66−1	0.17	6.47−2	6
80VAS/TRE	513.0–623.0	12	2.00	0.059	1.17−1	0.12	−1.19−2	1

TABLE 50. Parameters of cubic spline polynomials for 1-octadecanol

Statistics							
Heat Cap. Type	No. pnts. total	No. pnts. used	s_w	s/R	s_r %	s_b/R	+/−
C	30	30	0.087	1.66−1	0.17	5.17−4	2

Parameters					
Temp. range K	A_0	A_1	A_2	A_3	Level of accuracy
353.00- 488.00	−4.11839+2	3.27139+2	−7.05166+1	5.09432	V
488.00- 623.00	2.67153+2	−9.02741+1	1.50188+1	−7.48262−1	V

TABLE 51. Recommended values of heat capacities

T/K	Methanol		Ethanol		1-Propanol		1-Butanol	
	C_p	C_{sat}	C_p	C_{sat}	C_p	C_{sat}	C_p	C_{sat}
	J K^{-1} mol^{-1}							
160			87.75	87.75	106.87	106.87		
170			88.06	88.06	107.67	107.67		
180	70.78	70.79	88.53	88.53	108.61	108.61		
190	70.78	70.79	89.17	89.17	109.72	109.72	135.95	135.95
200	70.93	70.93	90.01	90.01	111.05	111.06	137.76	137.76
210	71.24	71.23	91.05	91.05	112.65	112.65	139.80	139.80
220	71.70	71.70	92.33	92.33	114.54	114.54	142.11	142.11
230	72.32	72.32	93.84	93.84	116.77	116.77	144.76	144.76
240	73.11	73.11	95.62	95.62	119.39	119.39	147.83	147.83
250	74.06	74.06	97.68	97.68	122.43	122.43	151.38	151.38
260	75.19	75.19	100.05	100.05	125.93	125.93	155.46	155.46
270	76.49	76.49	102.74	102.74	129.92	129.92	160.15	160.15
273.15	76.93	76.93	103.67	103.67	131.29	131.29	161.77	161.77
280	77.96	77.96	105.79	105.79	134.42	134.42	165.51	165.51
290	79.62	79.62	109.21	109.21	139.42	139.42	171.61	171.61
298.15	81.11	81.10	112.29	112.29	143.86	143.86	177.16	177.16
300	81.46	81.46	113.02	113.02	144.91	144.91	178.49	178.49
310	83.50	83.48	117.22	117.21	150.90	150.90	186.06	186.06
320	85.73	85.69	121.79	121.77	157.38	157.37	194.13	194.13
330	88.17	88.11	126.73	126.68	164.34	164.33	202.51	202.51
340	90.82	90.73	132.02	131.95	171.8	171.7	211.02	211.00
350	93.71	93.57	137.66	137.54	179.5	179.5	219.46	219.43
360	96.84	96.63	143.64	143.45	187.5	187.4	227.64	227.60
370	100.22	99.93	149.95	149.68	195.4	195.3	235.4	235.3
380	103.85	103.46			203.3	203.0	242.6	242.5
390	107.76	107.24			210.9	210.4	249.3	249.1
400	112.0	111.3			218.0	217.4	255.4	255.1
410	116.5	115.6			224.5	223.7	260.9	260.5
420	121.8	120.5			230.4	229.2	265.7	265.1
430	128.2	126.1			235.3	233.7	269.8	269.0
440	136.2	132.7			239.2	237.1	273.2	272.1
450	146.2	140.6			241.9	239.3	275.8	274.3
460	158.7	150.1			243.2	240.0	277.6	275.7
470	174.0	161.3						
480	192.7	174.5						
490	215.1	190.0						
500	241.7	208.0						

T/K	1-Pentanol	1-Hexanol	1-Heptanol	1-Octanol	1-Nonanol	1-Decanol	1-Undecanol
	C						
	J K^{-1} mol^{-1}						
210	166.07						
220	168.62						
230	171.59	198.0					
240	175.05	202.7	233.7				
250	179.07	207.6	241.0	251			
260	183.70	212.8	247.2	268			
270	189.00	218.7	253.0	280			
273.15	190.83	220.7	254.8	284			
280	195.06	225.3	258.9	290			
290	201.91	233.1	265.6	298		360.8	
298.15	208.14	240.4	272.1	305.2		370.6	
300	209.64	242.2	273.8	306.9		372.9	410
310	218.14	252.2	283.8	317.5	350.1	385.5	426
320	227.21	262.9	295.4	329.5	363.7	398.5	441
330	236.60	273.9	307.7	342.5	377.7	411.4	455
340	246.09	284.8	320.3	355.6	391.5	424.2	469
350	255.45	295.2	332.4	368.2	404.7	436.5	481

TABLE 51. Recommended values of heat capacities — Continued

T/K	1-Pentanol	1-Hexanol	1-Heptanol	1-Octanol	1-Nonanol	1-Decanol	1-Undecanol
				C			
				J K^{-1} mol^{-1}			
360	264.46	304.9	343.5	379.7	416.9	448.2	492
370	272.87	313	353	390	427.7	458.9	502
380	280.47	321	361	398	436.6	468.5	511
390	287	327	368	405	443.3	476.6	519
400	293	333	373	410	448.2	483.1	526
410	298	338	377	414	451.7	488.1	531
420	303	342	381	417	454.2	491.8	536
430	307	346	383	420	456.2	494.4	540
440	311	349	385	421	458.1	496.1	544
450	315	351	387	423	460.4	497.2	546
460	319	354	388		463.6	498.0	548
470						498.6	549
480						499.3	550
490						500.3	550
500						501.9	551
510							551
520							551

T/K	1-Dodecanol	1-Tridecanol	1-Tetradecanol	1-Pentadecanol	1-Hexadecanol	1-Octadecanol
				C		
				J K^{-1}mol^{-1}		
300	440.8					
310	454.3	491				
320	467.9	504	535	556	574.8	
330	481.3	517	548	567	597.8	
340	494.4	530	561	579	620.8	
350	507.0	544	574	591	643.8	
360	518.8	557	586	602		745
370	529.6	570	598	613		759
380	539.3	581	609	623		770
390	547.6	591	619	633		779
400	554.3	599	628	642		786
410	559.3	605	636	651		791
420	562.8	609	643	658		795
430	565.1	612	649	665		799
440	566.5	614	653	670		801
450	567.5	615	655	674		803
460	568.2	615	656	677		804
470	569.1	615	657	678		806
480	570.4	615	657	679		807
490		615	657	680		810
500		615	657	680		813
510		615	657	681		816
520		617	657	682		820
530		620	658	685		825
540		624	662	688		830
550		630	667	694		835
560			674	701		841
570			684	711		848
580.				723		855
590						862
600						869
610						877
620						885

TABLE 52. Parameters of quasi-polynomial extrapolation equation

	Methanol	Ethanol	1-Propanol	1-Butanol	1-Pentanol
T_c/K	512.64	513.92	536.78	563.05	588.15
E_{-1}	3.88036−1	1.44763	8.39646−2	1.18513−1	2.47192
E_0	1.53705+1	2.08051+1	3.28349+1	3.07969+1	−1.97851
E_1	−1.87104+1	−3.34900+1	−1.96232+1	3.06104+1	2.05915+2
E_2	1.53026+1	2.62108+1	1.40609+1	−2.09244+1	−1.39438+2
E_3	−7.51820+1	−6.45640+1	−3.82176+2	−6.58854+2	−1.42942+3
E_4	1.84466+2	1.51592+2	8.21541+2	1.35112+3	2.90385+3
E_5	−1.20695+2	−9.49146+1	−4.70937+2	−7.38872+2	−1.57311+3
s/R	1.48	2.46−2	1.30−1	3.42−1	1.70−1
Level of accuracy	V	II	IV	V	IV

	1-Hexanol	1-Heptanol	1-Octanol	1-Nonanol	1-Decanol
T_c/K	610.70	632.50	652.50	671.50	689.00
E_{-1}	1.34814+1	9.63250+1	5.07580+1	3.85829+1	3.72491+1
E_0	−1.28058+2	−9.51594+2	−4.64298+2	−3.19775+2	−3.04549+2
E_1	6.79675+2	3.35914+3	1.67352+3	1.15290+3	1.13039+3
E_2	−4.51822+2	−2.21545+3	−9.84434+2	−5.88093+2	−5.93279+2
E_3	−2.85553+3	−9.76192+3	−4.59810+3	−2.87080+3	−2.85866+3
E_4	5.69473+3	1.93148+4	8.11435+3	4.39320+3	4.50104+3
E_5	−3.02851+3	−1.01910+4	−3.81855+3	−1.79278+3	−1.88987+3
s/R	4.68−1	3.02−1	3.76−1	3.26−1	3.65−1
Level of accuracy	V	IV	V	IV	IV

6. Figures

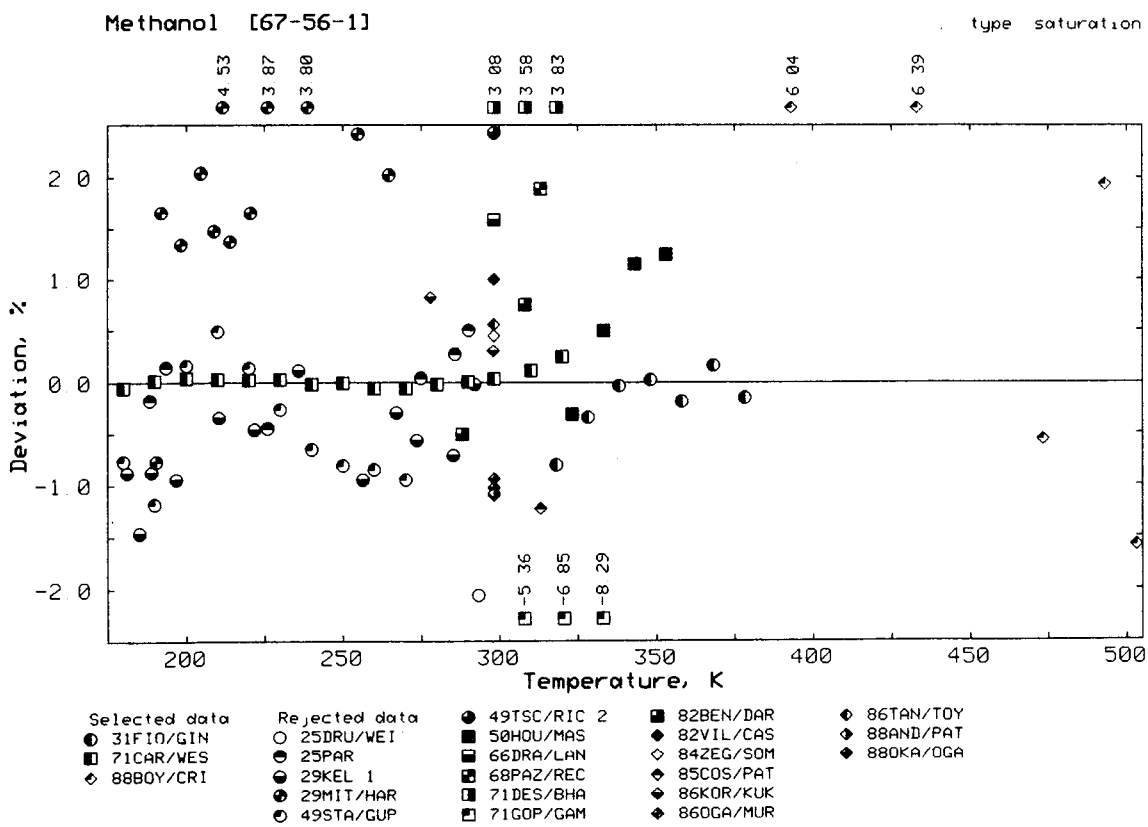

FIG. 1. Deviation plot for methanol

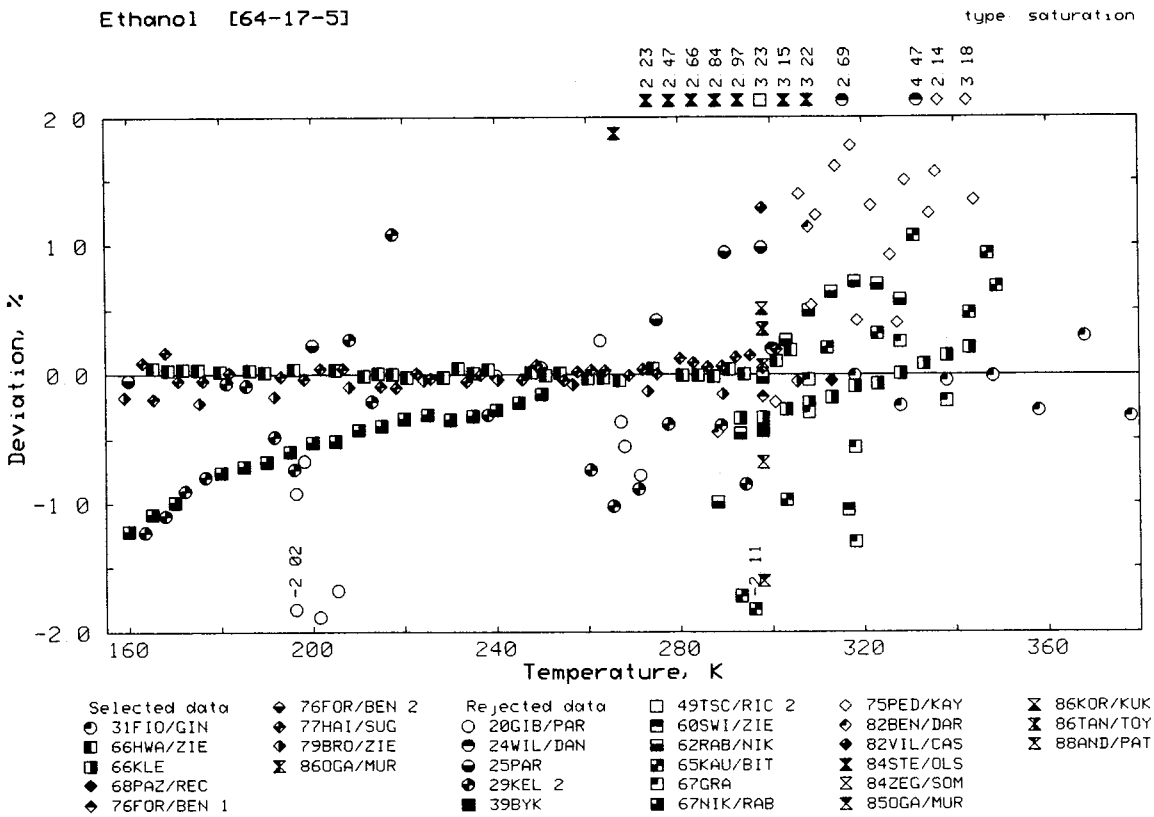

FIG. 2. Deviation plot for ethanol

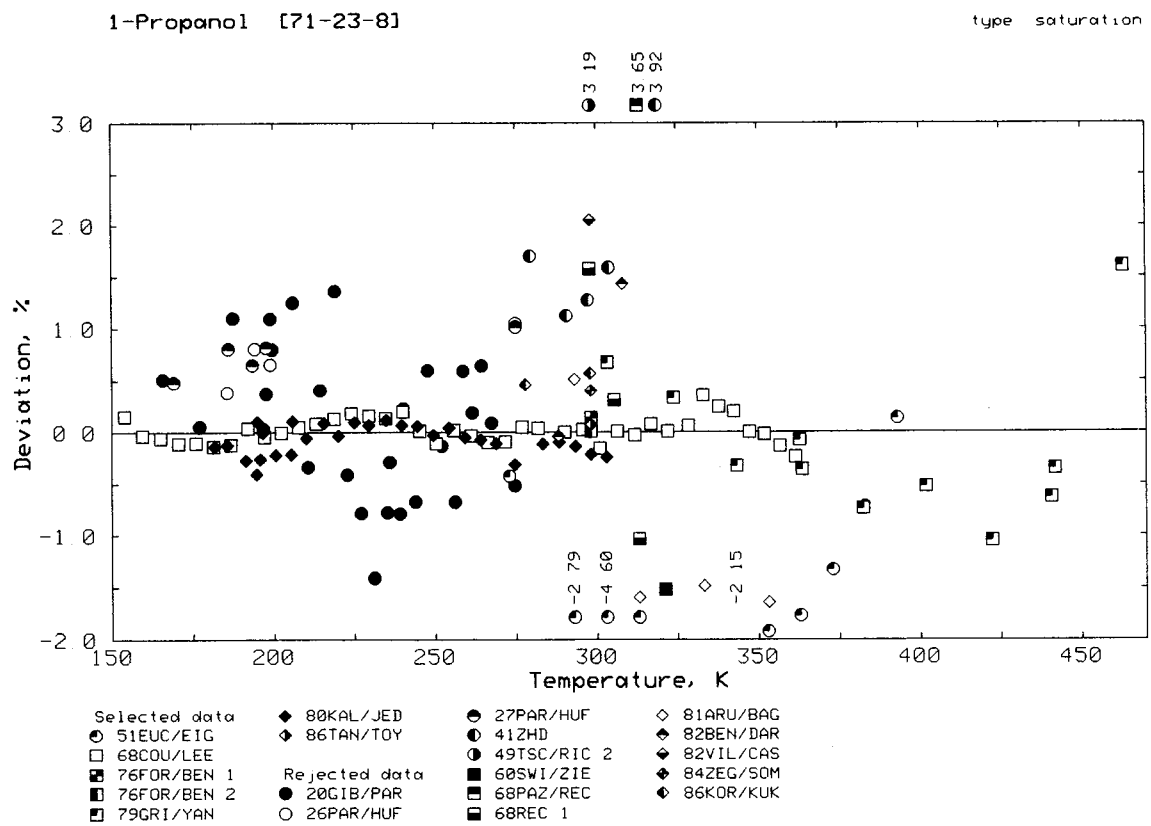

FIG. 3. Deviation plot for ethanol

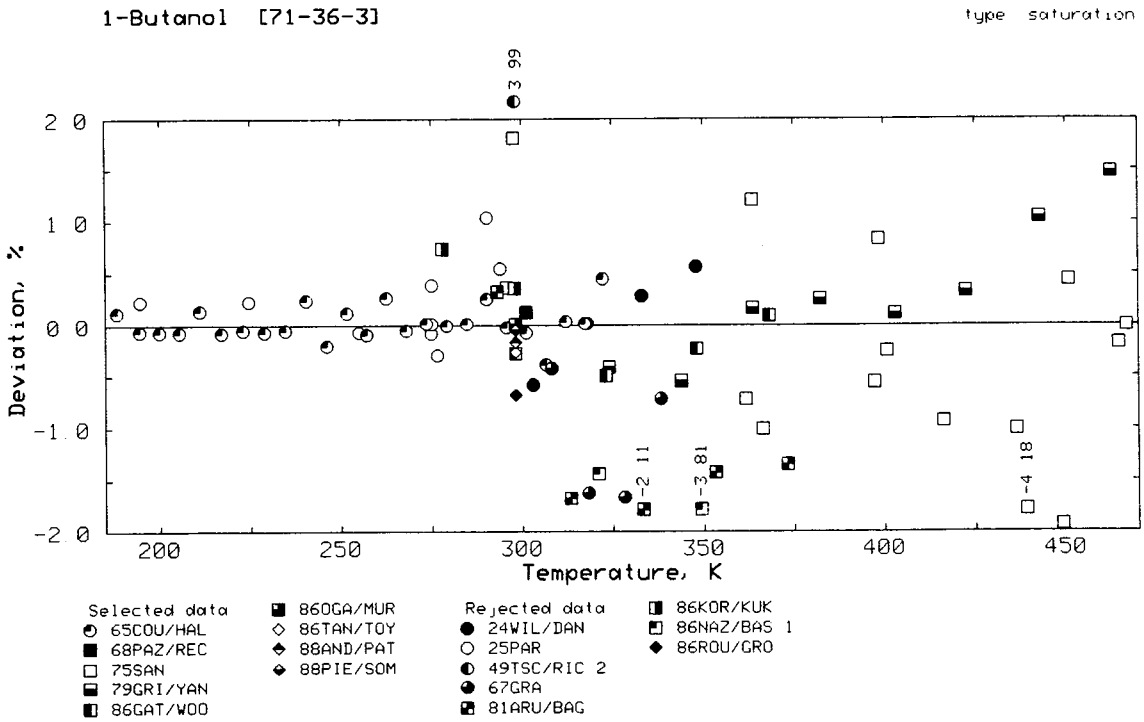

FIG. 4. Deviation plot for 1-butanol

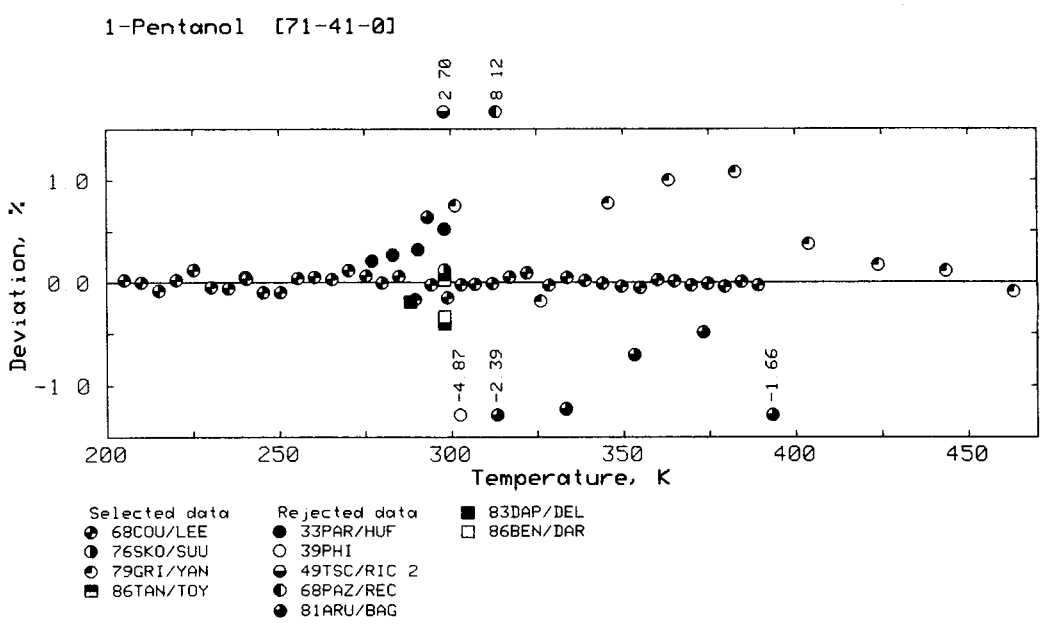

FIG. 5. Deviation plot for 1-pentanol

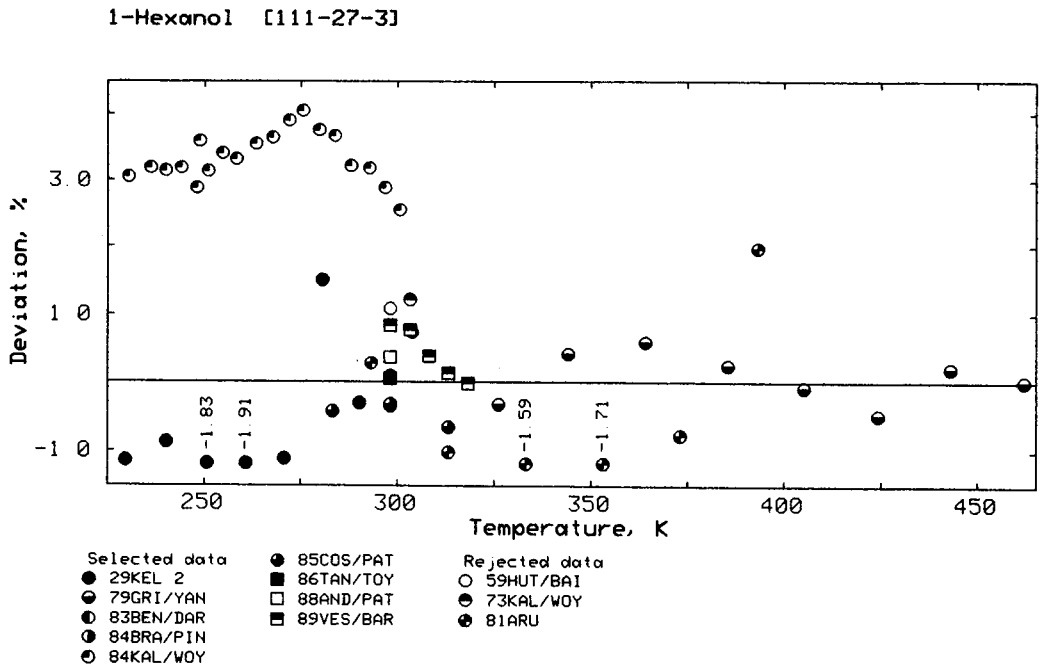

FIG. 6. Deviation plot for 1-hexanol

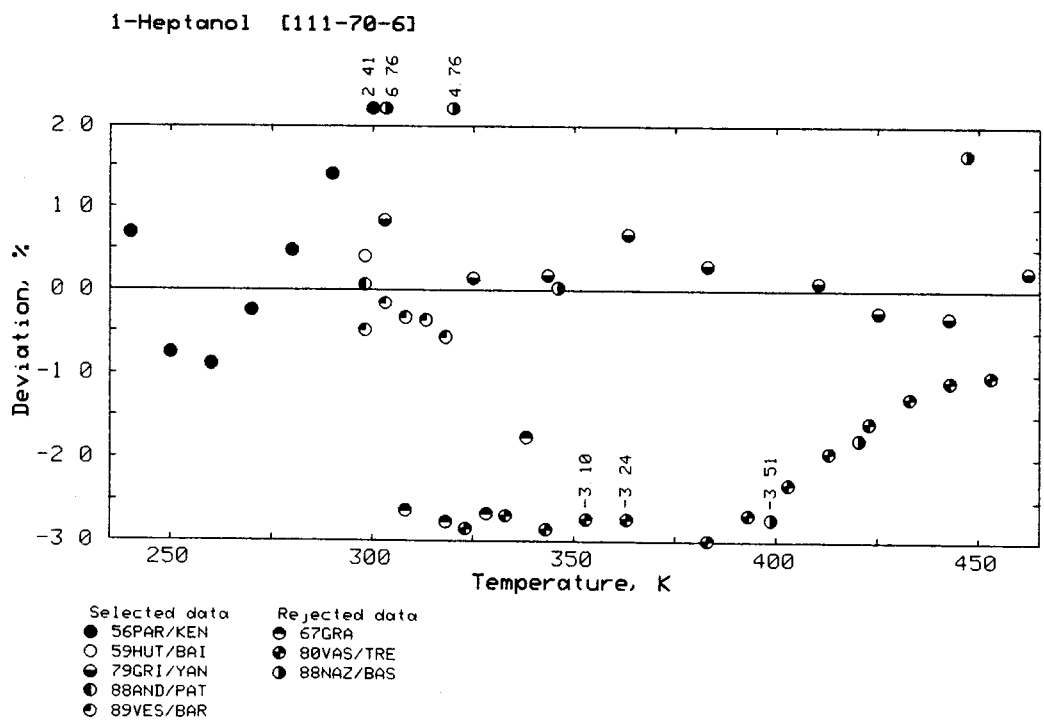

FIG. 7. Deviation plot for 1-heptanol

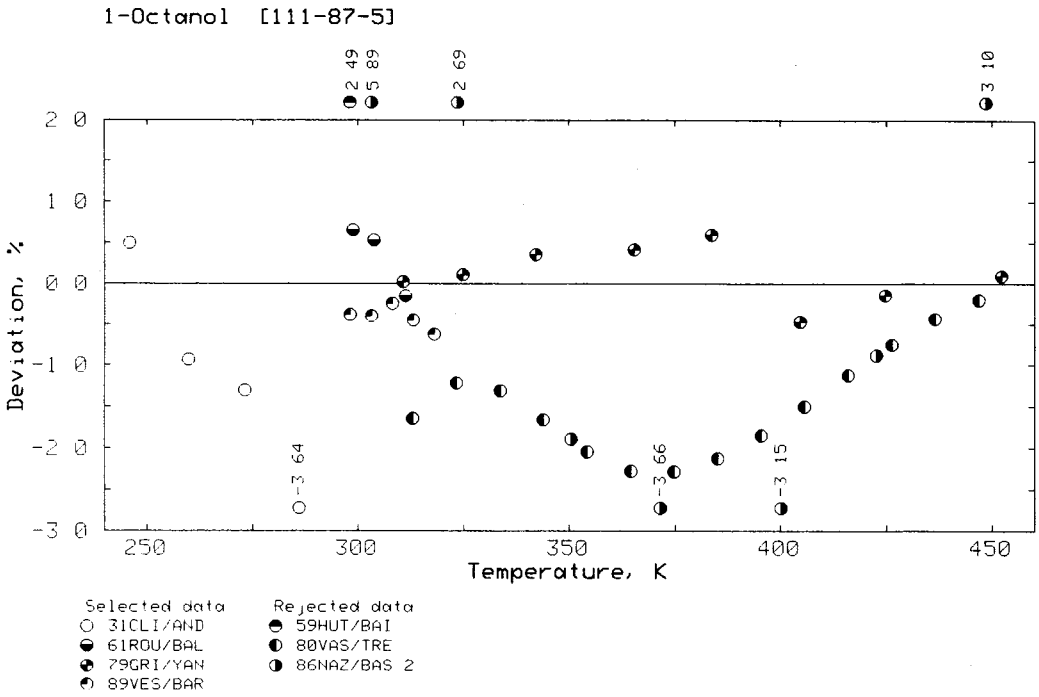

FIG. 8. Deviation plot for 1-octanol

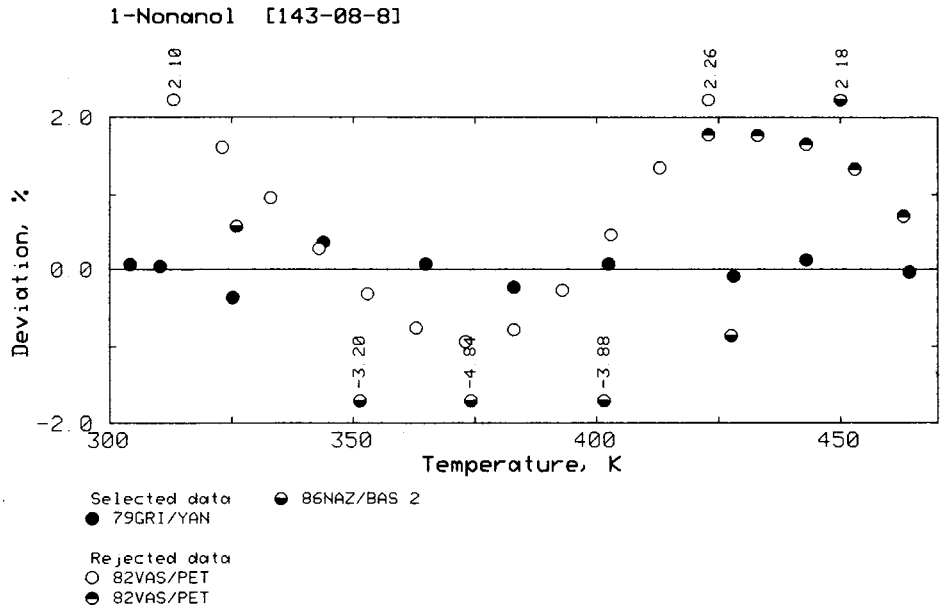

FIG. 9. Deviation plot for 1-nonanol

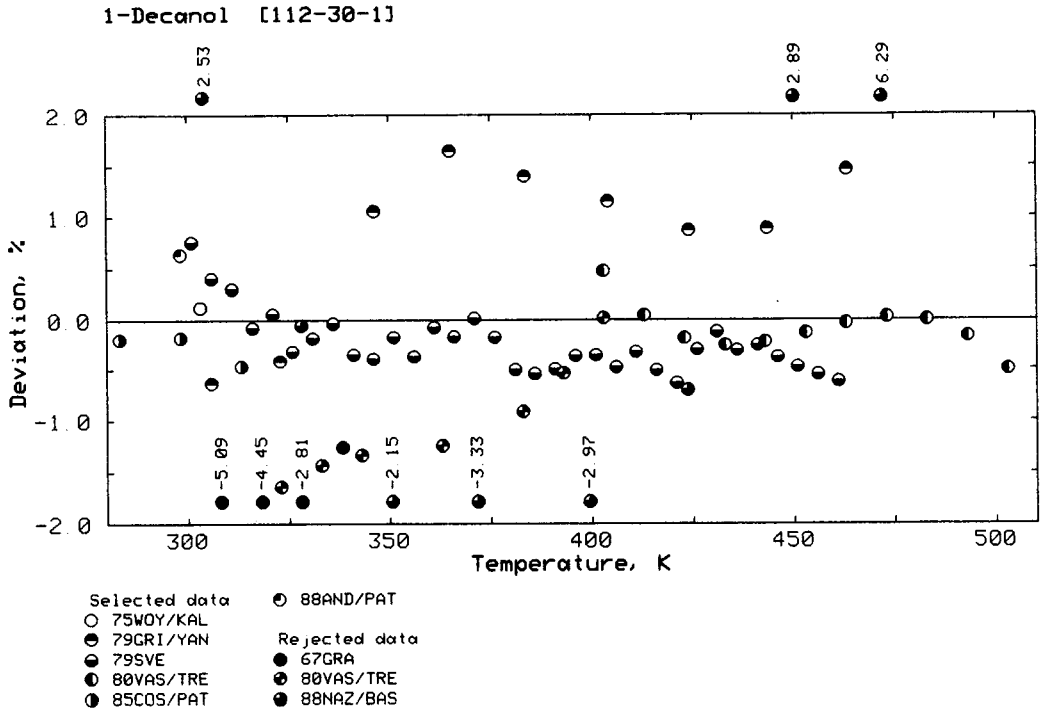

FIG. 10. Deviation plot for 1-decanol

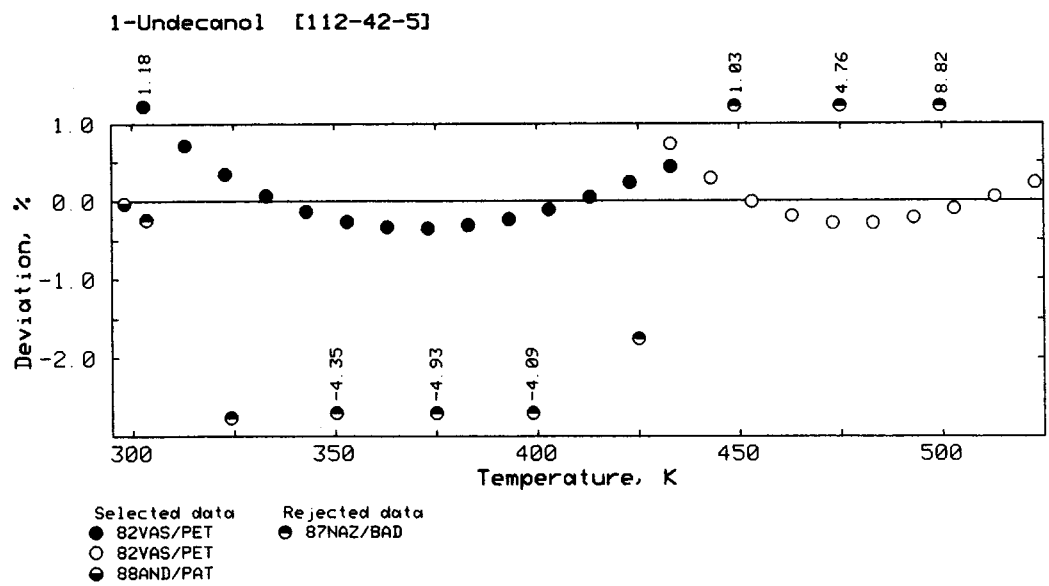

FIG. 11. Deviation plot for 1-undecanol

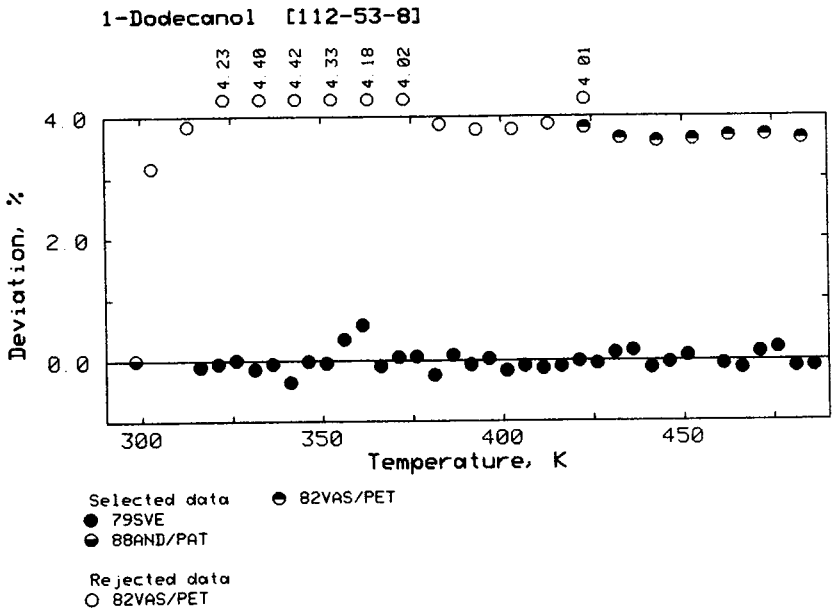

FIG. 12. Deviation plot for 1-dodecanol

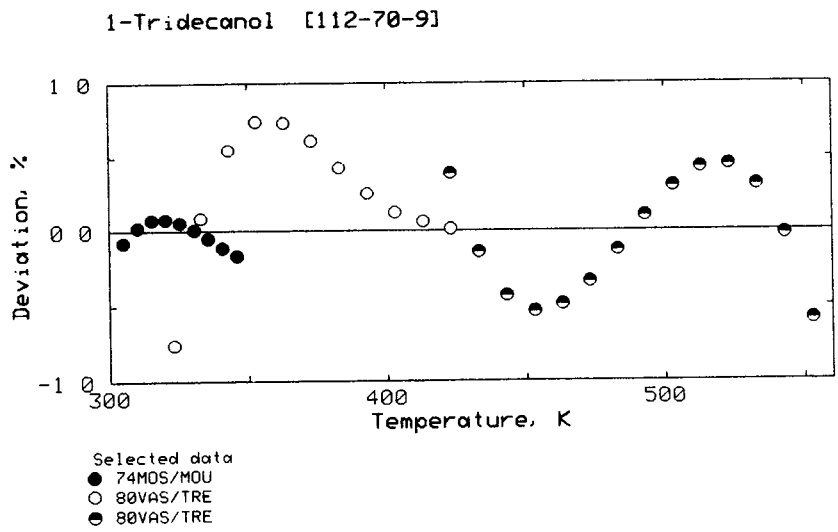

FIG. 13. Deviation plot for 1-tridecanol

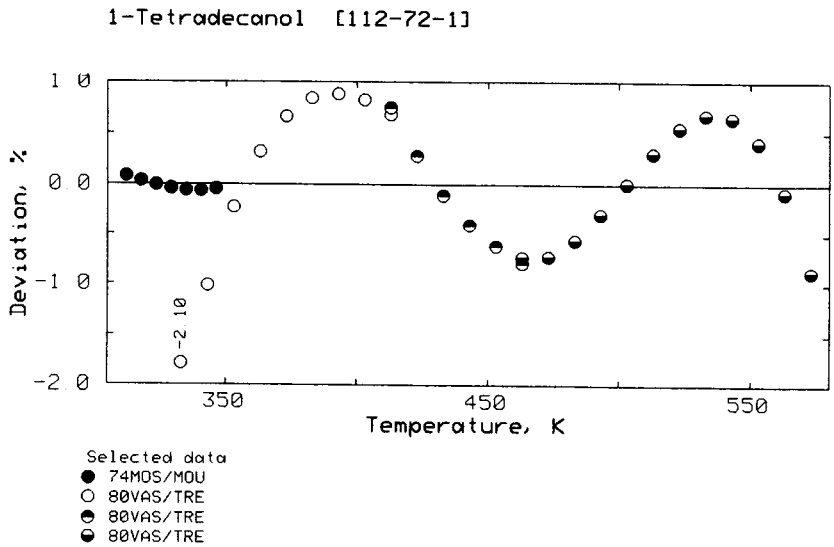

FIG. 14. Deviation plot for 1-tetradecanol

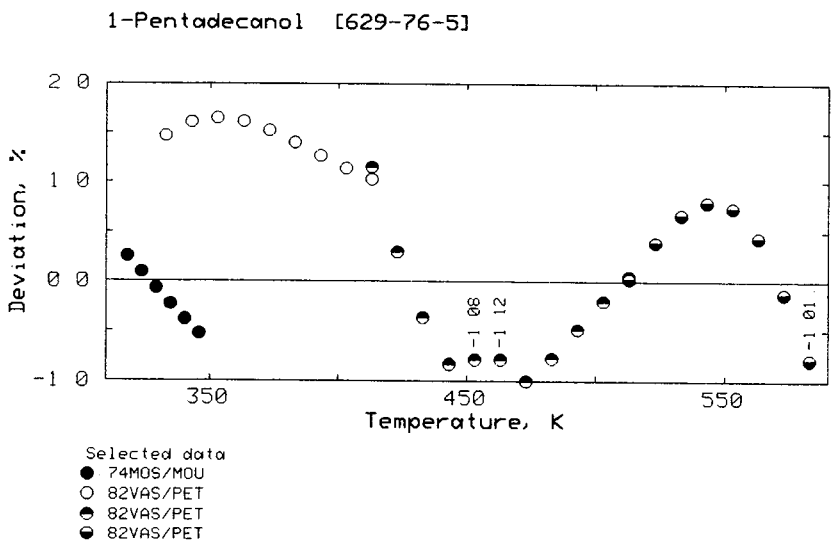

FIG. 15. Deviation plot for 1-pentadecanol

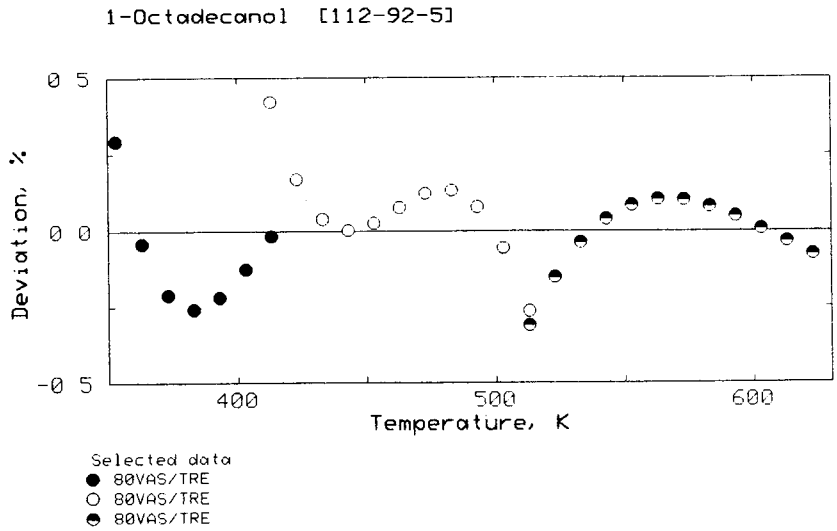

FIG. 16. Deviation plot for 1-octadecanol

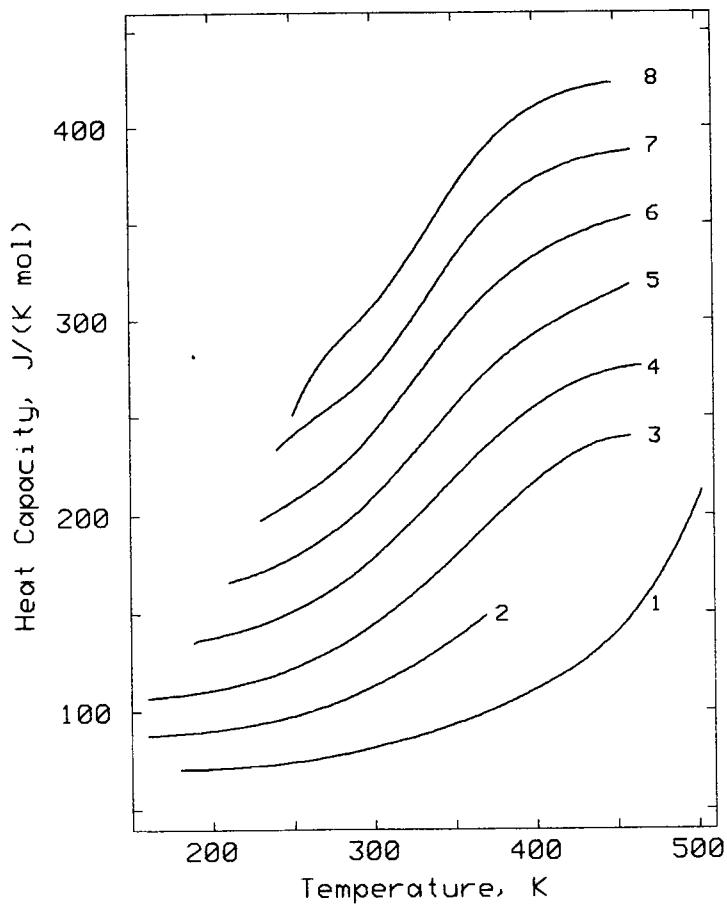

FIG. 17. Temperature dependence of saturation heat capacity for C_1 to C_8 1-alkanols

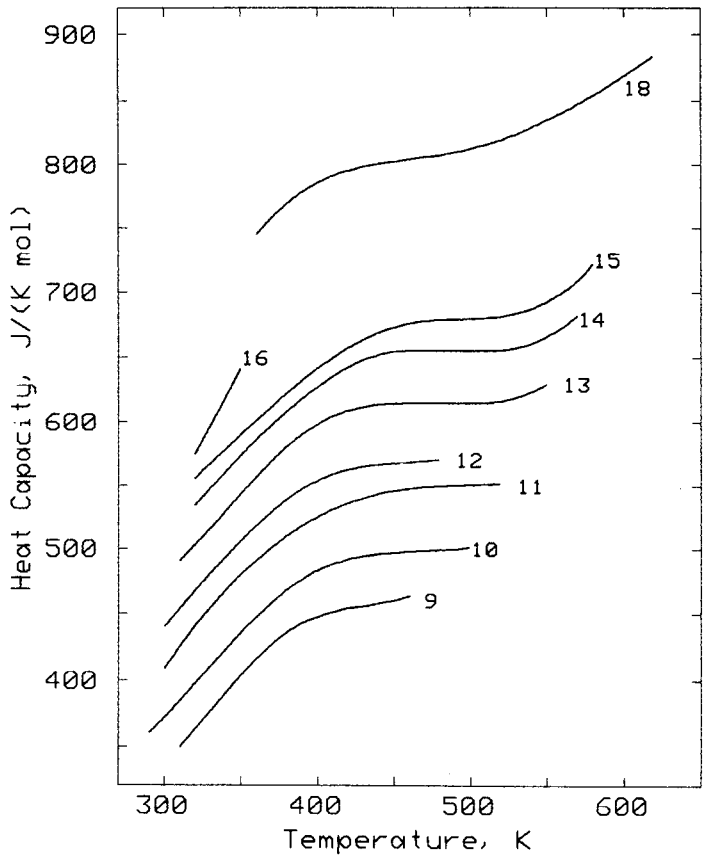

FIG. 18. Temperature dependence of saturation heat capacity for C_9 to C_{18} 1-alkanols

7. Acknowledgement

The authors thank E. S. Domalski for helpful comments on the methodology of evaluations and presentation of the data. One of the authors (Vladimír Majer) acknowledges the support of the Office of Standard Reference Data of the National Institute of Standards and Technology (grant no. 60NANB9DO912). The authors thank the Thermodynamic Research Center, Texas A&M University for donation of the TRC Tables.

48. References

*81REI von Reis, M. A., Ann. Phys. (Leipzig) [3] **13**, 447–65 (1881).

20GIB/LAT Gibson, G. E., Latimer, W. M., Parks, G. S., J. Am. Chem. Soc. **42**, 1533–42 (1920).

20GIB/PAR Gibson, G. E., Parks, G. S., Latimer, W. M., J. Am. Chem. Soc. **42**, 1542–50 (1920).

24WIL/DAN Williams, J. W., Daniels, F., J. Am. Chem. Soc. **46**, 903–17 (1924).

25DRU/WEI Drucker, C., Weissbach, H., Z., Phys. Chem. Stoechiom. Verwandtschaftslehre **117**, 209–41 (1925).

25PAR Parks, G. S., J. Am. Chem. Soc. **47**, 338–45 (1925).

26AND/LYN Andrews, D. H., Lynn, G., Johnston, J., J. Am. Chem. Soc. **48**, 1274–86 (1926).

26PAR/HUF Parks, G. S., Huffman, H. M., J. Am. Chem. Soc. **48**, 2788–93 (1926).

27PAR/HUF Parks, G. S., Huffman, H. M., J. Phys. Chem. **31**, 1842–55 (1927).

29KEL1 Kelley, K. K., J. Am. Chem. Soc. **51**, 180–7 (1929).

29KEL2 Kelley, K. K., J. Am. Chem. Soc. **51**, 779–86 (1929).

29MIT/HAR Mitsukuri, S., Hara, K., Bull. Chem. Soc. Jpn. **4**, 77–81 (1929).

31BLA/LEI Blacet, F. E., Leighton, P. A., Bartlett, E. P., J. Phys. Chem. **35**, 1935–43 (1931).

31CLI/AND Cline, J. K., Andrews, D. H., J. Am. Chem. Soc. **53**, 3668–73 (1931).

31FIO/GIN Fiock, E. F., Ginnings, D. C., Holton, W. B., J. Res., Natl. Bur. Std. (US) **6**, 881–900 (1931).

33FER/MIL Ferguson, A., Miller, J. T., Proc. Phys. Soc., London **45**, 194–207 (1933).

33PAR/HUF Parks, G. S., Huffman, H. M., Barmore, M., J. Am. Chem. Soc. **55**, 2733–40 (1933).

33TRE/WAT Trew, V. C. G., Watkins, G. M. C., Trans. Faraday Soc. **29**, 1310–8 (1933).

34KOL/UDO Kolosovskii, N. A., Udovenko, V. V., Zh. Obshch. Khim. **4**, 1027–33 (1934).

36ERN/WAT Ernst, R. C., Watkins, C. H., Ruwe, H. H., J. Phys. Chem.**40**, 627–35 (1936).

38PAN/DUD Panov, N., Dudnikov, I., Sbornik Trudov Opytnogo Zavoda Im. Akad. S. V. Lebedeva (1938) 36–40 from Chem. Abstr. **34**, 1514 (1940).

39BYK Bykov, V. T., Zh. Fiz. Khim. **13**, 1013–9 (1939).

39PHI Philip, N. M., Proc. Indian Acad. Sci., Sect. A **9**, 109–20 (1939).

41ZHD Zhdanov, A. K., Zh. Obshch. Khim. **11**, 471–82 (1941).

45SCO/MEY Scott, R. B., Meyers, C. H., Rands, R. D. Jr., Brickwedde, F. G., Bekkedahl, N., J. Res., Natl. Bur. Std. **35**, 39–85 (1945).

46HOG Hoge, H. J., J. Res., Natl. Bur. Stand. **36**, 111–8 (1946).

47SKU Skuratov, S. M., Kolloid. Zh. **9**, 133–40 (1947).

49LEE Leech, J. W., Proc. Phys. Soc., London Sect. B **62**, 390–8 (1949).

49STA/GUP Staveley, L. A. K., Gupta, A. K., Trans. Faraday Soc. **45**, 50–61 (1949).

49TSC/RIC1 Tschamler, H., Richter, E., Monatsh. Chem. **80**, 510–6 (1949).

49TSC/RIC2 Tschamler, H., Richter, E., Wettig, F., Monatsh. Chem. **80**, 749–58 (1949).

49WEI Weissberger, A., Editor, Physical Methods of Organic Chemistry, Interscience Publ. Co., New York 1/1 (1949).

50HOU/MAS Hough, E. W., Mason, D. M., Sage, B. H., J. Am. Chem. Soc. **72**, 5775–7 (1950).

50SAG/HOU Sage, B. H., Hough, E. W., Anal. Chem. **22**, 1304–9 (1950).

51EUC/EIG Eucken, A., Eigen, M., Z. Elektrochem. **55**, 343–54 (1951).

53WES/HAT Westrum, E. F. Jr., Hatcher, J. B., Osborne, D. W., J. Chem. Phys. **21**, 419–23 (1953).

55HUT/MAN Hutchinson, E., Manchester, K. E., Rev. Sci. Intrum. **26**, 364–7 (1955).

56MUR/VAN Murti, P. S., Van Winkle, M., J. Chem. Eng. Data **3**, 65–71 (1956).

56PAR/KEN Parks, G. S., Kennedy, W. D., Gates, R. R., Mosley, J. R., Moore, G. E., Renquist, M. L., J. Am. Chem. Soc. **78**, 56–9 (1956).

56POP/KOL Popov, M. M., Kolesov, V. P., Zh. Obshch. Khim. **26**, 2385–93 (1956).

58SWI/ZIE Swietoslawski, W., Zielenkiewicz, A., Bull. Acad. Pol. Sci., Ser. Sci. Chim. Geol. Geogr. **6**, 365–6 (1958).

59HUT/BAI Hutchinson, E., Bailey, L. G., Z. Phys. Chem. (Frankfurt am Main) **21**, 30–7 (1959).

60SWI/ZIE Swietoslawski, W., Zielenkiewicz, A., Bull. Acad. Pol. Sci., Ser. Sci. Chim. **8**, 651–3 (1960).

61ROU Rousseau, R. A., Ph. D. Thesis, John Hopkins University, Baltimore (1961).

62KAT Katayama, T., Kagaku Kogaku (Chemical Engineering, Japan) **26**, 361–72 (1962).

62RAB/NIK Rabinovich, I. B., Nikolaev, P. N., Dokl. Akad. Nauk. SSSR **142**, 1335–8 (1962).

63AND/COU Andon, R. J. L., Counsell, J. F., Herington, E. F. G., Martin, J. F., Trans. Faraday Soc. **59**, 830–5 (1963).

64MOE/THO Moelwyn-Hughes, E. A., Thorpe, P. L., Proc. R. Soc. London, Ser. A **278**, 574–87 (1964).

65COU/HAL Counsell, J. F., Hales, J. L., Martin, J. F., Trans. Faraday Soc. **61**, 1869–75 (1965).

65KAU/BIT Kauer, E., Bittrich, J. H., Wiss. Z. Tech. Hochsch. Chem. "Carl Schorlemmer", Leuna-Merseburg **7**, 73–6 (1965).

65SUG/SEK Suga, H., Seki, S., Bull. Chem. Soc. Jpn. **38**, 1000–6 (1965).

66DRA/LAN Drakin, S. I., Lantukhova, L. V., Karapet'yanc, M. Kh., Zh. Fiz. Khim. **40**, 451–5 (1966).

66HWA/ZIE Hwa, S. C. P., Ziegler, W. T., J. Phys. Chem. **70**, 2572–93 (1966).

66KLE Klesper, I., Z. Phys. Chem. (Frankfurt am Main) **51**, 1–12 (1966).

67GRA Grabner, R. W., Lehigh University Thesis, Univ. Microfilms Publ. No. 67-14935, 1–191 (1967).

67NIK/RAB Nikolaev, P. N., Rabinovich, I. B., Lebedev, B. V., Zh. Fiz. Khim. **41**, 1294–9 (1967).

68COU/LEE Counsell, J. F., Lees, E. B., Martin, J. F., J. Chem. Soc. A (1968) 1819–23

68PAZ/REC Paz Andrade, M. I., Recacho, E., Paz Fernandez, J. M., Acta Cient. Compostelana **5** (2), 49–55 (1968).

68REC1 Recko, W. M., Bull. Acad. Pol. Sci., Ser. Sci. Chim. **16**, 543–8 (1968).

68REC2 Recko, W. M., Bull. Acad. Pol. Sci., Ser. Sci. Chim. **16**, 549–52 (1968).

68REC3 Recko, W. M., Bull. Acad. Pol. Sci., Ser. Sci. Chim. **16**, 553–5 (1968).

69PER/COM Perkin-Elmer, DSC-2 Commercial Calorimeter, Prospectus (1969).

70AMB/SPR Ambrose, D., Sprake, C. H. S., J. Chem. Thermodyn. **2**, 631–45 (1970).

70PAZ/PAZ Paz Andrade, M. I., Paz J. M., Recacho, E., An. Quim. **66**, 961–7 (1970).

70REC Recko, W. M., Bull. Acad. Pol. Sci., Ser. Sci. Chim. **18**, 297–301 (1970).

70TOU/MAK Touloukian, Y. S., Makita, T., Thermophysical Properties of Matter, Vol. **6**, Specific Heats of Nonmetallic Liquids and Gases, IFI/Plenum, New York (1970).

71CAR/WES Carlson, H. G., Westrum, E. F. Jr., J. Chem. Phys. **54**, 1464–71 (1971).

71DES/BHA Deshpande, D. D., Bhatgadde, L. G., Aust. J. Chem. **24**, 1817–22 (1971).

71GOP/GAM Gopal, E. S. R., Gambhir, R. D., Govindarajan, K., Viswanathan, B., J. Indian Inst. Sci. **53**, 355–67 (1971).

71KON/SUU Konicek, J., Suurkuusk, J., Wadso, I., Chem. Scripta **1**, 217–20 (1971).

71PIC/LED Picker, P., Leduc, P. A., Philip, P. R., Desnoyers, J. E., J. Chem. Thermodyn. **3**, 631–42 (1971).

73KAL/WOY Kalinowska, B., Woycicka, M., Bull. Acad. Pol. Sci., Ser. Sci. Chim. **21**, 845–8 (1973).

73WIL/CHA Wilhoit, R. C., Zwolinski, B. J., Physical and Thermodynamic Properties of Aliphatic Alcohols, J. Phys. Chem. Ref. Data, Vol. **2**, Supplement 1 (1973).

74MOS/MOU Mosselman, C., Mourik, J., Dekker, H., J. Chem. Thermodyn. **6**, 477–87 (1974).

75PED/KAY Pedersen, M. J., Kay, W. B., Hershey, H. C., J. Chem. Thermodyn. **7**, 1107–18 (1975).

75RAS/GRI Rastorguev, Yu. L., Grigor'ev, B. A., Yanin, G. S., Izv. Vyssh. Ucheb. Zaved., Neft Gaz **18** (**4**), 73–7 (1975).

75SAN San Jose, J. L., Ph. D. Thesis, Massachussetts Institute of Technology, Cambridge (1975).

75WOY/KAL Woycicka, M. K., Kalinowska, B., Bull. Acad. Pol. Sci., Ser. Sci. Chim. **23**, 759–64 (1975).

76FOR/BEN1 Fortier, J.-L., Benson, G. C., J. Chem. Thermodyn. **8**, 411–23 (1976).

76FOR/BEN2 Fortier, J.-L., Benson, G. C., Picker P., J. Chem. Thermodyn. **8**, 289–99 (1976).

76SKO/SUU Skold, R., Suurkuusk, J., Wadso, I., J. Chem. Thermodyn. **8**, 1075–80 (1976).

76TOU/MAK Touloukian, Y. S., Makita, T., Thermophysical Properties of Matter, Supplement to, Vol. **6**, Specific Heats of Nonmetallic Liquids and Gases, IFI/Plenum, New York (1976).

77HAI/SUG Haida O., Suga H., Seki S., J. Chem. Thermodyn. **9**, 1133–48 (1977).

77MUR/SUB Murthy, N. M., Subrahmanyam, S. V., Indian J. Pure Appl. Phys. **15**, 485–9 (1977).

78BYV/JAS Byval'tsev, Yu. A., Jasiunas, B. V., Perelygin, V. M., Izv. Vyssh. Ucheb. Zaved., Pishch. Tekhnol. (5), 169–70 (1978).

79BRO/ZIE Brown, G. N. Jr., Ziegler, W. T., J. Chem. Eng. Data **24**, 319–30 (1979).

79GRI/YAN Grigor'ev, B. A., Yanin, G. S., Rastorguev, Yu. L., Tr. Gosud. Inst. Azot. Prom. (Tr. GIAP), (Moscow) **54**, 57–64 (1979).

79DYK/REP Dykyj, J., Repas, M., Tlak Nasytenych Par Organickych Zlucenin, Veda Bratislava (1979).

79ENG Heat Capacity and Enthalpy of Liquids: Aliphatic Alcohols, Engineering Sciences Data Item Number 79028, Engineering Sciences Data Unit, London (1979).

79KOL Kollar-Hunek, K., Ph. D. Thesis, Budapest Technical University, Budapest (1979).

79SVE Svensson, C., J. Chem. Thermodyn. **11**, 593–6 (1979).

79VES/ZAB Vesely, F., Zábranský, M., Svoboda, V., Pick, J., Collect. Czech. Chem. Commun. 44, 3529–32 (1979).

80KAL/JED Kalinowska, B., Jedlinska, J., Woycicki, W., Stecki, J., J. Chem. Thermodyn. **12**, 891–6 (1980).

80VAS/TRE Vasil'ev I. A., Treibsho E. I., Korkhov A. D., Petrov, V. M., Orlova, N. G., Balakina, M. M., , Inzh. - Fiz. Zh. **39**, 1054–60 (1980).

81ARU Arutyunyan, G. S., Izv. Akad. Nauk Azerb. SSR, Ser. Fiz.-Tekn. Mat. Nauk **2 (2)**, 97–9 (1981).

81ARU/BAG Arutyunyan, G. S., Bagdasaryan, S. S., Kerimov, A. M., Izv. Akad. Nauk Azerb. SSR, Ser. Fiz. -Tekn. Mat. Nauk **2 (6)**, 94–7 (1981).

82BEN/DAR Benson, G. C., D'Arcy, P. J., J. Chem. Eng. Data **27**, 439–42 (1982).

82VAS/PET Vasil'ev, I. A., Petrov, V. M., Treibsho, E. I., Zh. Prikl. Khim. (Leningrad) **55**, 2116–7 (1982).

82VIL/CAS Villamanan, M. A., Casanova, C., Roux-Desgranges G., Grolier, J.-P. E., Thermochim. Acta **52**, 279–83 (1982).

83BEN/DAR Benson, G. C., D'Arcy, P. J., Sugamori, M. E., Thermochim. Acta **71**, 161–6 (1983).

83DAP/DEL D'Aprano, A., DeLisi, R., Donato, D. I., J. Solution Chem. **12**, 383–400 (1983).

83KUK/KOR Kukharenko, V. A., Korolev, V. P., Krestov, G. A., Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Tekhnol. **26**, 369–72 (1983).

83MAC/STR Machado, J. R. S., Streett, W. B., J. Chem. Eng. Data **28**, 218–23 (1983).

83MCG McGarry, J., Ind. Eng. Chem., Process Des. Develop. **2**, 313–22 (1983).

83ROU/ROU Roux, A. H., Roux-Desgranges, G., Grolier, J.-P. E., Viallard, A., Calorim. Anal. Therm. **14**, 142–50 (1983).

84BRA/PIN Bravo, R., Pintos, M., Baluja, M. C., Paz Andrade M. J., Roux-Desgranges G., Grolier, J.-P. E., J. Chem. Thermodyn. **16**, 73–9 (1984).

84COM IUPAC Commission on Atomic Weights and Abundances, Pure and Appl. Chem. **56**, 653 (1984).

84DOM/EVA Domalski, E. S., Evans, E. H., Hearing, E. D., Heat Capacities and Entropies of Organic Compounds in the Condensed Phase, J. Phys. Chem. Ref. Data, Vol. **13**, Supplement No. 1 (1984).

84KAL/WOY Kalinowska, B., Woycicki, W., J. Chem. Thermodyn. **16**, 609–13 (1984).

84STE/OLS Stephens, M., Olson, J. D., Thermochim. Acta **76** (79–85), (1984).

84VAS/PET Vasil'ev, I. A., Petrov, V. M., Termodin. Svoistva Kislorodsoderzhashchikh Organ. Soedinenii, Khimiya, Leningrad (1984).

84ZEG/SOM Zegers, H. C., Somsen, G., J. Chem. Thermodyn. **16**, 225–35 (1984).

85CAM/THO Campbell, S. W., Thodos, G., J. Chem. Eng. Data **30**, 102–11 (1985).

85COS/PAT Costas, M., Patterson, D., J. Chem. Soc., Faraday Trans. **181**, 635–54 (1985).

85OGA Ogawa, H. Murakami, S., Thermochim. Acta **88**, 255–60 (1985).

85WIL/CHA Wilhoit, R. C., Chao, J., Hall, K. R., J. Phys. Chem. Ref. Data **14**, 1–175 (1985).

86BEN/DAR Benson, G. C., D'Arcy, P. J., J. Chem. Thermodyn. **18**, 493–8 (1986).

86GAT/WOO Gates, J. A., Wood, R. H., Cobos, J. C., Casanova, C., Roux, A. H., Roux-Desgranges G., Grolier, J.-P. E., Fluid Phase Equilib. **27**, 137–51 (1986).

86KOR/KUK Korolev, V. P., Kukharenko, V. A., Krestov, G. A., Zh. Fiz. Khim. **60**, 1854–7 (1986).

86NAZ/BAS1 Naziev, Ya. M., Bashirov, M. M., Badalov, Yu. A., Inzh. - Fiz. Zh. **51**, 789–95 (1986).

86NAZ/BAS2 Naziev, Ya. M., Bashirov, M. M., Badalov, Yu. A., Inzh. - Fiz. Zh. **51**, 998–1004 (1986).

86OGA/MUR Ogawa, H., Murakami, S., Thermochim. Acta **109**, 145–54 (1986).

86ROU/GRO Roux-Desgranges, G., Grolier, J.-P. E., Villamanan, M. A., Casanova, C., Fluid Phase Equilib. **25**, 209–30 (1986).

86TAN/TOY Tanaka, R., Toyama, S., Murakami, S., J. Chem. Thermodyn. **18**, 63–73 (1986).

86SMI/SRI Smith, B. D., Sristava, R., Thermodynamic Data for Pure Compounds, Phys. Sci. Data **25**, Part B, Elsevier, Amsterdam (1986).

87LAN/CRI Lankford, J. I., Criss, C. M., J. Solution Chem. **16**, 885–906 (1987).

87NAZ/BAD Naziev, Ya. M., Badalov, Yu. A., Bashirov, M. M., Izv. Vyssh. Ucheb. Zaved., Neft Gaz **30 (5)**, 59–62 (1987).

87TRC TRC Thermodynamic Tables - Nonhydrocarbons, Thermodynamics Research Center, Texas A&M University System, College Station, Texas (1987).

88AND/PAT Andreoli-Ball, L., Patterson, D., Costas, M., Caceres-Alonso, M., J. Chem. Soc., Faraday Trans. **184**, 3991–4012 (1988).

88BOY/CRI Boyette, S., Criss, C. M., J. Chem. Eng. Data **33**, 426–9 (1988).

88NAZ/BAS Naziev, Ya. M., Bashirov, M. M., Teplofiz. Vys. Temp. **26**, 58–62 (1988).

88OKA/OGA Okano, T., Ogawa, H., Murakami, S., Can. J. Chem. **66**, 713–7 (1988).

88PIE/SOM Piekarski, H., Somsen, G., Tenth IUPAC Conf. Chem. Thermodyn., Prague (1988) **I-54**

89VES/BAR Vesely, F., Barcal, P., Zábranský, M., Svoboda, V., Collect. Czech. Chem. Commun. **54**, 602–7 (1989).

90ZAB/RUZ Zábranský, M., Růžička, V. Jr., Majer, V., Sb. Vys. Sk. Chemicko-Technol. Praze N10, **55**, (1990).