

SELECTED DATA ON MIXTURES

International DATA Series\*

1a. EXCESS ENTHALPY

National Institute of Standards and Technology, Boulder, CO 80305-3328

Compiled by Thermodynamics Research Center

**Components:** 1. 1,2-Dichloroethane, C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub> [107-06-2]  
 2. Butyl ethanoate, C<sub>6</sub>H<sub>12</sub>O<sub>2</sub> [123-86-4]  
**State:** Binary system, single-phase liquid; pure components, both liquid  
**Variables:** H<sup>E</sup>, molar excess enthalpy  
 x<sub>i</sub>, mole fraction of component i  
**Parameters:** T, temperature  
**Constants:** P, pressure  
**Method:** Direct calorimetric measurement of the enthalpy of mixing at constant T and P and variable x<sub>i</sub>; ref. 1

**Author(s) of table:** Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)  
**Edited by:** Skrzecz, A.; Mączynski, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

SOURCE OF DATA

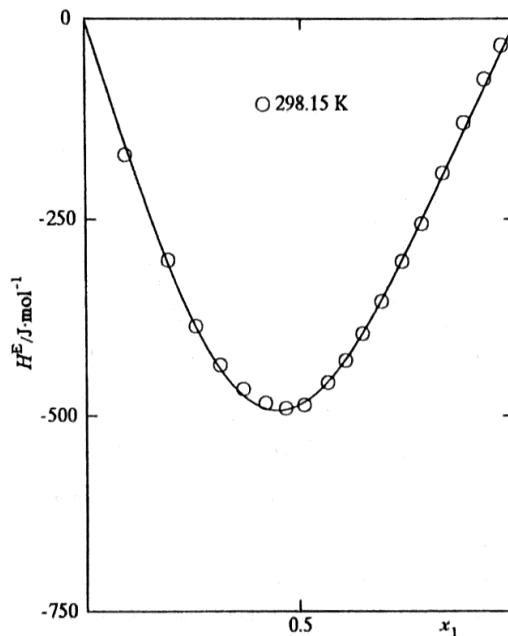
Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

DIRECT EXPERIMENTAL VALUES

Notes: P, 101.325 kPa

T/K = 298.15

x <sub>1</sub>	H <sup>E</sup> /J·mol <sup>-1</sup>						
0.0929	-168.4						
0.1918	-300.7						
0.2568	-384.4						
0.3141	-433.9						
0.3679	-465.1						
0.4196	-483.0						
0.4682	-489.9						
0.5111	-485.8						
0.5662	-456.9						
0.6074	-428.4						
0.6477	-394.1						
0.6928	-352.3						
0.7397	-301.8						
0.7853	-255.1						
0.8326	-191.5						
0.8802	-127.9						
0.9260	-73.8						
0.9651	-32.5						



Points, direct experimental H<sup>E</sup> values, curve, H<sup>E</sup><sub>calc</sub> calculated from the equation.

SMOOTHING EQUATION

$$H_{\text{calc}}^E = x_1 x_2 a_1 / [1 + \sum_{i=2}^n a_i (x_1 - x_2)^{i-1}]$$

Coefficients a<sub>i</sub> in the smoothing equation, standard deviation σ<sub>d</sub>, and maximum deviation δ<sub>m</sub> determined by least-squares analysis.

T/K	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	σ <sub>d</sub>	δ <sub>m</sub>
	J·mol <sup>-1</sup>						
298.15	-1936.8 (11.1)	0.2947 (0.0134)	0.455 (0.034)			6.7	10.1

The standard deviations σ(a<sub>i</sub>) of the coefficients a<sub>i</sub> are given in parentheses  
 δ<sub>m</sub> = max |H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>|; σ<sub>d</sub> = [Σ(H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>)<sup>2</sup>/(N - n)]<sup>1/2</sup>  
 N, number of direct experimental values; n, number of coefficients a<sub>i</sub>  
 All direct experimental values equally weighted

AUXILIARY INFORMATION

**Apparatus:** Calvet type microcalorimeter, model MS-80D (Setaram, Lyon, France) with stainless steel batch mixing cell (vol. 8 cm<sup>3</sup>) and with negligible vapor phase, described in ref. 2.

**Procedure:** The microcalorimeter was calibrated electrically after each measurement by the Joule effect, as described in ref. 2. Test measurements on the cyclohexane + hexane and benzene + heptadecane systems were in agreement to within 1% (over central range of concentration) with the data reported, respectively, in refs 3 and 4.

**Materials:** 1. Fluka AG (Busch, Switzerland) "puriss" grade material of stated GLC purity > 99.5 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 1245.38; n(D, 298.15 K) = 1.4422.  
 2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99.7 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 875.91; n(D, 298.15 K) = 1.3920.

**Errors:** |δT|/K = 0.02; |δx<sub>1</sub>| = 0.0005; |δH<sup>E</sup>|/J·mol<sup>-1</sup> < 10.

REFERENCES

1. *Int. DATA Ser., Ser. A, Guideline 3a*, 1994, 22(1).
2. Chaar, M.; Ortega, J.; Toledo-Marante, F. J.; González, C. *J. Chem. Thermodyn.*, 2001, 33, 689.
3. McGlashan, M. L.; Stoeckli, H. F. *J. Chem. Thermodyn.*, 1969, 1, 589.
4. Diaz-Peña, M.; Mendiúña, C. *J. Chem. Thermodyn.*, 1974, 6, 387.

0147-1503/4/01-46\$4.00

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Int. DATA Ser., Sel. Data Mixtures, Ser. A 2004, 32(1), 46-60

Compiled by Thermodynamics Research Center

**Components:** 1. 1,3-Dichloropropane, C<sub>3</sub>H<sub>6</sub>Cl<sub>2</sub> [142-28-9]  
 2. Butyl ethanoate, C<sub>6</sub>H<sub>12</sub>O<sub>2</sub> [123-86-4]  
**State:** Binary system, single-phase liquid; pure components, both liquid  
**Variables:** H<sup>E</sup>, molar excess enthalpy  
 x<sub>i</sub>, mole fraction of component i  
**Parameters:** T, temperature  
**Constants:** P, pressure  
**Method:** Direct calorimetric measurement of the enthalpy of mixing at constant T and P and variable x<sub>i</sub>; ref. 1

**Author(s) of table:** Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)  
**Edited by:** Skrzecz, A.; Mączyński, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

SOURCE OF DATA

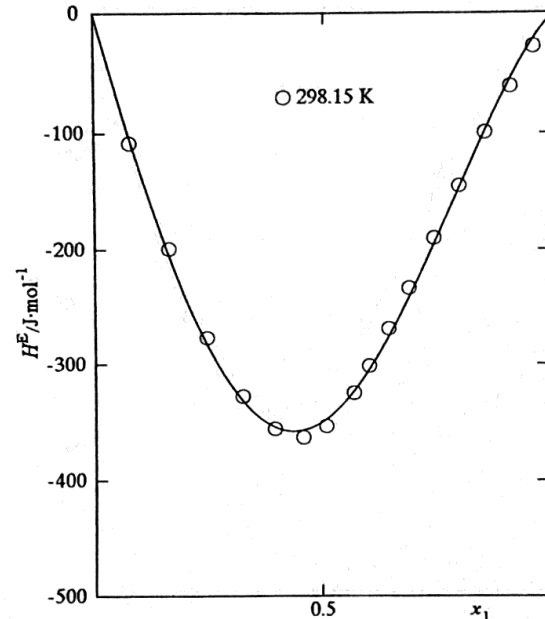
Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

DIRECT EXPERIMENTAL VALUES

Notes: P, 101.325 kPa

T/K = 298.15

x <sub>1</sub>	H <sup>E</sup> J·mol <sup>-1</sup>						
0.0762	-108.0						
0.1633	-199.0						
0.2459	-276.5						
0.3239	-327.4						
0.3950	-355.0						
0.4584	-362.8						
0.5097	-352.9						
0.5704	-324.2						
0.6052	-300.7						
0.6483	-268.3						
0.6927	-232.9						
0.7457	-189.8						
0.8004	-144.8						
0.8560	-98.9						
0.9087	-60.5						
0.9583	-27.4						



Points, direct experimental H<sup>E</sup> values, curve, H<sup>E</sup><sub>calc</sub> calculated from the equation.

SMOOTHING EQUATION

$$H_{\text{calc}}^E = x_1 x_2 a_1 / [1 + \sum_{i=2}^n a_i (x_1 - x_2)^{i-1}]$$

Coefficients a<sub>i</sub> in the smoothing equation, standard deviation σ<sub>d</sub>, and maximum deviation δ<sub>m</sub> determined by least-squares analysis.

T/K	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	σ <sub>d</sub>	δ <sub>m</sub>
	J·mol <sup>-1</sup>					J·mol <sup>-1</sup>	
298.15	-1394.6 (9.6)	497 (21)	517 (47)			5.7	7.2

The standard deviations σ(a<sub>i</sub>) of the coefficients a<sub>i</sub> are given in parentheses  
 δ<sub>m</sub> = max |H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>|; σ<sub>d</sub> = [Σ(H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>)<sup>2</sup> / (N - n)]<sup>1/2</sup>  
 N, number of direct experimental values; n, number of coefficients a<sub>i</sub>  
 All direct experimental values equally weighted

AUXILIARY INFORMATION

**Apparatus:** Calvet type microcalorimeter, model MS-80D (Setaram, Lyon, France) with stainless steel batch mixing cell (vol. 8 cm<sup>3</sup>) and with negligible vapor phase, described in ref. 2

**Procedure:** The microcalorimeter was calibrated electrically after each measurement by the Joule effect, as described in ref. 2. Test measurements on the cyclohexane + hexane and benzene + heptadecane systems were in agreement to within 1% (over central range of concentration) with the data reported, respectively, in refs 3 and 4.

**Materials:** 1. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 1178.45; n(D, 298.15 K) = 1.4455.  
 2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99.7 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 875.91; n(D, 298.15 K) = 1.3920.

**Errors:** |δT|/K = 0.02; |δx<sub>1</sub>| = 0.0005; |δH<sup>E</sup>|/J·mol<sup>-1</sup> < 7.

REFERENCES

1. Int. DATA Ser., Ser. A, Guideline 3a, 1994, 22(1).
2. Chaar, M.; Ortega, J.; Toledo-Marante, F. J.; González, C. *J. Chem. Thermodyn.*, 2001, 33, 689.
3. McGlashan, M. L.; Stoekli, H. F. *J. Chem. Thermodyn.*, 1969, 1, 589.
4. Diaz-Peña, M.; Mendiña, C. *J. Chem. Thermodyn.*, 1974, 6, 387.

0147-1503/4/01-47\$4.00

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Int. DATA Ser., Ser. A, Guideline 3a, 1994, 22(1), 46-60

SELECTED DATA ON MIXTURES  
International DATA Series\*

1a. EXCESS ENTHALPY

Compiled by Thermodynamics Research Center

National Institute of Standards and Technology, Boulder, CO 80305-3328

**Components:** 1. 1,4-Dichlorobutane, C<sub>4</sub>H<sub>8</sub>Cl<sub>2</sub> [110-56-5]  
2. Butyl ethanoate, C<sub>6</sub>H<sub>12</sub>O<sub>2</sub> [123-86-4]  
**State:** Binary system, single-phase liquid; pure components, both liquid  
**Variables:** H<sup>E</sup>, molar excess enthalpy  
x<sub>i</sub>, mole fraction of component i  
**Parameters:** T, temperature  
**Constants:** P, pressure  
**Method:** Direct calorimetric measurement of the enthalpy of mixing at constant T and P and variable x<sub>i</sub>; ref. 1

**Author(s) of table:** Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)  
**Edited by:** Skrzecz, A.; Mączynski, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

SOURCE OF DATA

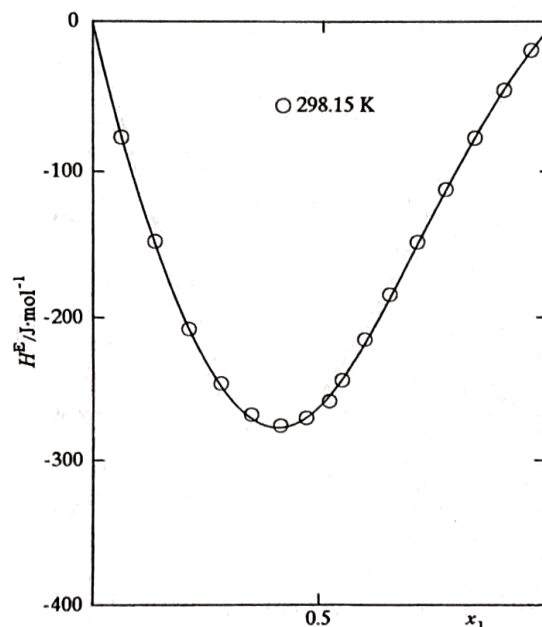
Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

DIRECT EXPERIMENTAL VALUES

Notes: P, 101.325 kPa

T/K = 298.15

x <sub>1</sub>	H <sup>E</sup> J·mol <sup>-1</sup>						
0.0617	-76.7						
0.1359	-147.8						
0.2102	-207.8						
0.2813	-245.7						
0.3495	-267.9						
0.4131	-275.3						
0.4710	-270.0						
0.5220	-258.3						
0.5494	-243.3						
0.5990	-215.2						
0.6530	-184.0						
0.7111	-148.2						
0.7713	-112.0						
0.8327	-77.2						
0.8936	-45.6						
0.9511	-19.2						



Points, direct experimental H<sup>E</sup> values, curve, H<sup>E</sup><sub>calc</sub> calculated from the equation.

SMOOTHING EQUATION

$$H_{\text{calc}}^E = x_1 x_2 a_1 / [1 + \sum_{i=2}^n a_i (x_1 - x_2)^{i-1}]$$

Coefficients a<sub>i</sub> in the smoothing equation, standard deviation σ<sub>d</sub>, and maximum deviation δ<sub>m</sub> determined by least-squares analysis.

T/K	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	σ <sub>d</sub>	δ <sub>m</sub>
	J·mol <sup>-1</sup>					J·mol <sup>-1</sup>	
298.15	-1045.4 (3.3)	0.6051 (0.0133)	0.832 (0.021)	0.452 (0.039)		1.9	4.6

The standard deviations σ(a<sub>i</sub>) of the coefficients a<sub>i</sub> are given in parentheses  
δ<sub>m</sub> = max |H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>|; σ<sub>d</sub> = [Σ(H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>)<sup>2</sup> / (N - n)]<sup>1/2</sup>  
N, number of direct experimental values; n, number of coefficients a<sub>i</sub>  
All direct experimental values equally weighted

AUXILIARY INFORMATION

**Apparatus:** Calvet type microcalorimeter, model MS-80D (Setaram, Lyon, France) with stainless steel batch mixing cell (vol. 8 cm<sup>3</sup>) and with negligible vapor phase, described in ref. 2.

**Procedure:** The microcalorimeter was calibrated electrically after each measurement by the Joule effect, as described in ref. 2. Test measurements on the cyclohexane + hexane and benzene + heptadecane systems were in agreement to within 1% (over central range of concentration) with the data reported, respectively, in refs 3 and 4.

**Materials:** 1. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 1133.06; n(D, 298.15 K) = 1.4522.  
2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99.7 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 875.91; n(D, 298.15 K) = 1.3920.

**Errors:** |δT|/K = 0.02; |δx<sub>1</sub>| = 0.0005; |δH<sup>E</sup>|/J·mol<sup>-1</sup> < 6.

REFERENCES

1. *Int. DATA Ser., Ser. A, Guideline 3a*, 1994, 22(1).
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4. Diaz-Peña, M.; Mendiña, C. *J. Chem. Thermodyn.*, 1974, 6, 387.

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Int. DATA Ser., Sel. Data Mixtures, Ser. A 2004, 32(1), 46-60

SELECTED DATA ON MIXTURES  
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1a. EXCESS ENTHALPY

National Institute of Standards and Technology, Boulder, CO 80305-3328

Compiled by Thermodynamics Research Center

**Components:** 1. 1,5-Dichloropentane, C<sub>5</sub>H<sub>10</sub>Cl<sub>2</sub> [628-76-2]  
2. Butyl ethanoate, C<sub>6</sub>H<sub>12</sub>O<sub>2</sub> [123-86-4]  
**State:** Binary system, single-phase liquid; pure components, both liquid  
**Variables:** H<sup>E</sup>, molar excess enthalpy  
x<sub>i</sub>, mole fraction of component i  
**Parameters:** T, temperature  
**Constants:** P, pressure  
**Method:** Direct calorimetric measurement of the enthalpy of mixing at constant T and P and variable x<sub>i</sub>; ref. 1

**Author(s) of table:** Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)  
**Edited by:** Skrzecz, A.; Mączyski, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

SOURCE OF DATA

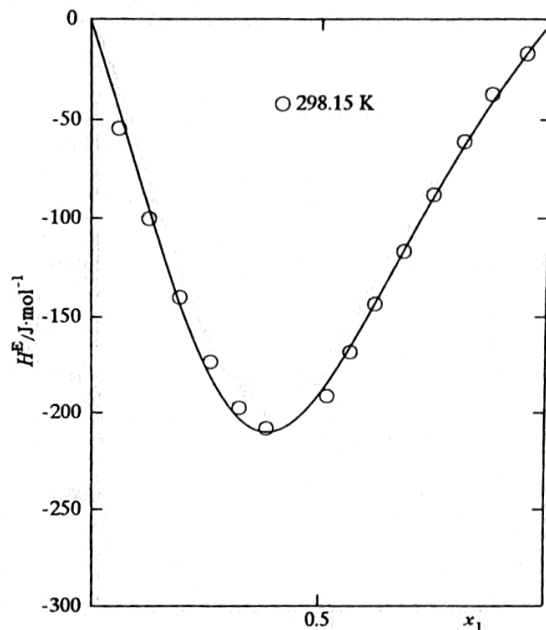
Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

DIRECT EXPERIMENTAL VALUES

Notes: P, 101.325 kPa

T/K = 298.15

x <sub>1</sub>	H <sup>E</sup> J·mol <sup>-1</sup>						
0.0600	-54.3						
0.1257	-99.9						
0.1940	-139.8						
0.2617	-173.2						
0.3248	-197.5						
0.3852	-207.9						
0.5188	-191.2						
0.5697	-168.1						
0.6236	-143.3						
0.6839	-116.3						
0.7473	-87.5						
0.8118	-60.9						
0.8701	-37.2						
0.9450	-16.8						



Points, direct experimental H<sup>E</sup> values, curve, H<sup>E</sup><sub>calc</sub> calculated from the equation.

SMOOTHING EQUATION

$$H_{\text{calc}}^E = x_1 x_2 a_1 / [1 + \sum_{i=2}^n a_i (x_1 - x_2)^{i-1}]$$

Coefficients a<sub>i</sub> in the smoothing equation, standard deviation σ<sub>d</sub>, and maximum deviation δ<sub>m</sub> determined by least-squares analysis.

T/K	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	σ <sub>d</sub>	δ <sub>m</sub>
	J·mol <sup>-1</sup>						
298.15	-760.1 (10.8)	0.814 (0.037)	0.887 (0.084)			5.3	7.4

The standard deviations σ(a<sub>i</sub>) of the coefficients a<sub>i</sub> are given in parentheses  
δ<sub>m</sub> = max |H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>|; σ<sub>d</sub> = [Σ(H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>)<sup>2</sup> / (N - n)]<sup>1/2</sup>  
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AUXILIARY INFORMATION

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**Materials:** 1. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 1095.27; n(D, 298.15 K) = 1.4545.  
2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99.7 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 875.91; n(D, 298.15 K) = 1.3920.

**Errors:** |δT|/K = 0.02; |δx<sub>1</sub>| = 0.0005; |δH<sup>E</sup>|/J·mol<sup>-1</sup> < 10.

REFERENCES

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49

Int. DATA Ser., Sel. Data Mixtures, Ser. A 2004, 32(1), 46-60

SELECTED DATA ON MIXTURES

International DATA Series\*

1a. EXCESS ENTHALPY

National Institute of Standards and Technology, Boulder, CO 80305-3328

Compiled by Thermodynamics Research Center

**Components:** 1. 1,6-Dichlorohexane, C<sub>6</sub>H<sub>12</sub>Cl<sub>2</sub> [2163-00-0]  
 2. Butyl ethanoate, C<sub>6</sub>H<sub>12</sub>O<sub>2</sub> [123-86-4]  
**State:** Binary system, single-phase liquid; pure components, both liquid  
**Variables:** H<sup>E</sup>, molar excess enthalpy  
 x<sub>i</sub>, mole fraction of component i  
**Parameters:** T, temperature  
**Constants:** P, pressure  
**Method:** Direct calorimetric measurement of the enthalpy of mixing at constant T and P and variable x<sub>i</sub>; ref. 1

**Author(s) of table:** Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)  
**Edited by:** Skrzecz, A.; Mączyński, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

SOURCE OF DATA

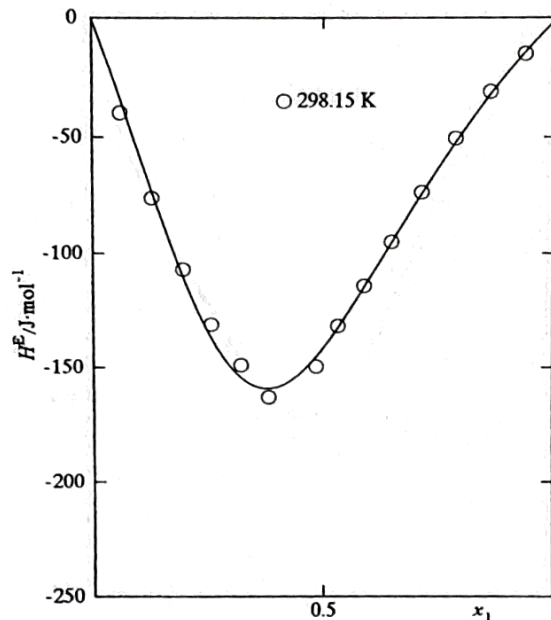
Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

DIRECT EXPERIMENTAL VALUES

Notes: P, 101.325 kPa

T/K = 298.15

x <sub>1</sub>	H <sup>E</sup> J·mol <sup>-1</sup>						
0.0596	-39.8						
0.1282	-76.1						
0.1950	-107.0						
0.2573	-130.9						
0.3213	-148.7						
0.3810	-162.9						
0.4865	-149.4						
0.5344	-131.6						
0.5909	-114.0						
0.6500	-95.0						
0.7140	-73.4						
0.7865	-50.4						
0.8595	-30.8						
0.9335	-15.0						



Points, direct experimental H<sup>E</sup> values, curve, H<sup>E</sup><sub>calc</sub> calculated from the equation.

SMOOTHING EQUATION

$$H_{\text{calc}}^E = x_1 x_2 a_1 / [1 + \sum_{i=2}^n a_i (x_1 - x_2)^{i-1}]$$

Coefficients a<sub>i</sub> in the smoothing equation, standard deviation σ<sub>d</sub>, and maximum deviation δ<sub>m</sub> determined by least-squares analysis.

T/K	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	σ <sub>d</sub>	δ <sub>m</sub>
	J·mol <sup>-1</sup>					J·mol <sup>-1</sup>	
298.15	-565.0 (7.3)	0.902 (0.037)	0.968 (0.082)			3.9	5.7

The standard deviations σ(a<sub>i</sub>) of the coefficients a<sub>i</sub> are given in parentheses  
 δ<sub>m</sub> = max |H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>| ; σ<sub>d</sub> = [Σ(H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>)<sup>2</sup> / (N - n)]<sup>1/2</sup>  
 N, number of direct experimental values; n, number of coefficients a<sub>i</sub>  
 All direct experimental values equally weighted

AUXILIARY INFORMATION

**Apparatus:** Calvet type microcalorimeter, model MS-80D (Setaram, Lyon, France) with stainless steel batch mixing cell (vol. 8 cm<sup>3</sup>) and with negligible vapor phase, described in ref. 2.

**Procedure:** The microcalorimeter was calibrated electrically after each measurement by the Joule effect, as described in ref. 2. Test measurements on the cyclohexane + hexane and benzene + heptadecane systems were in agreement to within 1% (over central range of concentration) with the data reported, respectively, in refs 3 and 4.

**Materials:** 1. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 1067.59; n(D, 298.15 K) = 1.4555.  
 2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99.7 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 875.91; n(D, 298.15 K) = 1.3920.

**Errors:** |δT|/K = 0.02; |δx<sub>1</sub>| = 0.0005; |δH<sup>E</sup>|/J·mol<sup>-1</sup> < 10.

REFERENCES

1. *Int. DATA Ser., Ser. A, Guideline 3a*, 1994, 22(1).
2. Chaar, M.; Ortega, J.; Toledo-Marante, F. J.; González, C. *J. Chem. Thermodyn.*, 2001, 33, 689.
3. McGlashan, M. L.; Stoeckli, H. F. *J. Chem. Thermodyn.*, 1969, 1, 589.
4. Diaz-Peña, M.; Mendiña, C. *J. Chem. Thermodyn.*, 1974, 6, 387.

0147-1503/4/01-50\$4.00

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Int. DATA Ser., Sel. Data Mixtures, Ser. A 2004, 32(1), 46-60

SELECTED DATA ON MIXTURES  
International DATA Series\*

1a. EXCESS ENTHALPY

National Institute of Standards and Technology, Boulder, CO 80305-3328

Compiled by Thermodynamics Research Center

Components: 1. 1,2-Dichloroethane, C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub> [107-06-2]  
2. Butyl propanoate, C<sub>7</sub>H<sub>14</sub>O<sub>2</sub> [590-01-2]

State: Binary system, single-phase liquid; pure components, both liquid

Variables: H<sup>E</sup>, molar excess enthalpy  
x<sub>i</sub>, mole fraction of component i

Parameters: T, temperature

Constants: P, pressure

Method: Direct calorimetric measurement of the enthalpy of mixing at constant T and P and variable x<sub>i</sub>; ref. 1

Author(s) of table: Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)

Edited by: Skrzecz, A.; Mączyński, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

SOURCE OF DATA

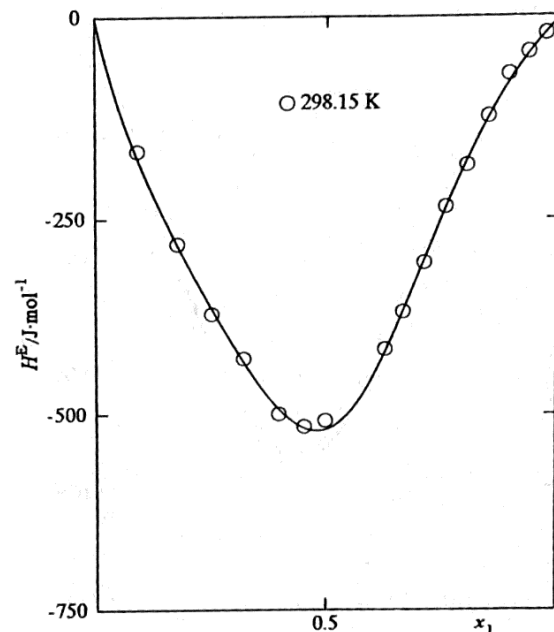
Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

DIRECT EXPERIMENTAL VALUES

Notes: P, 101.325 kPa

T/K = 298.15

x <sub>1</sub>	H <sup>E</sup> J·mol <sup>-1</sup>						
0.0903	-163.7						
0.1766	-280.3						
0.2525	-370.3						
0.3215	-427.9						
0.3984	-499.7						
0.4533	-515.5						
0.5006	-507.7						
0.6291	-416.4						
0.6683	-367.9						
0.7125	-304.9						
0.7564	-234.5						
0.8012	-182.0						
0.8461	-120.7						
0.8891	-69.3						
0.9305	-42.6						
0.9674	-20.3						



Points, direct experimental H<sup>E</sup> values, curve, H<sup>E</sup><sub>calc</sub> calculated from the equation.

SMOOTHING EQUATION

$$H_{\text{calc}}^E = x_1 x_2 a_1 / [1 + \sum_{i=2}^n a_i (x_1 - x_2)^{i-1}]$$

Coefficients a<sub>i</sub> in the smoothing equation, standard deviation σ<sub>d</sub>, and maximum deviation δ<sub>m</sub> determined by least-squares analysis.

T/K	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	σ <sub>d</sub>	δ <sub>m</sub>
	J·mol <sup>-1</sup>					J·mol <sup>-1</sup>	
298.15	-2073.2 (13.5)	0.164 (0.026)	1.337 (0.044)	1.392 (0.084)		6.3	10.5

The standard deviations σa<sub>i</sub> of the coefficients a<sub>i</sub> are given in parentheses  
δ<sub>m</sub> = max |H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>|; σ<sub>d</sub> = [Σ(H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>)<sup>2</sup> / (N - n)]<sup>1/2</sup>  
N, number of direct experimental values; n, number of coefficients a<sub>i</sub>  
All direct experimental values equally weighted

AUXILIARY INFORMATION

Apparatus: Calvet type microcalorimeter, model MS-80D (Setaram, Lyon, France) with stainless steel batch mixing cell (vol. 8 cm<sup>3</sup>) and with negligible vapor phase, described in ref. 2.

Procedure: The microcalorimeter was calibrated electrically after each measurement by the Joule effect, as described in ref. 2. Test measurements on the cyclohexane + hexane and benzene + heptadecane systems were in agreement to within 1% (over central range of concentration) with the data reported, respectively, in refs 3 and 4.

Materials: 1. Fluka AG (Basel, Switzerland) "puriss" grade material of stated GLC purity > 99.5 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 1245.38; n(D, 298.15 K) = 1.4422.  
2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 865.77; n(D, 298.15 K) = 1.4031.

Errors: |δT|/K = 0.02; |δx<sub>1</sub>| = 0.0005; |δH<sup>E</sup>|/J·mol<sup>-1</sup> < 20.

REFERENCES

- Int. DATA Ser., Ser. A, Guideline 3a, 1994, 22(1).
- Chaar, M.; Ortega, J.; Toledo-Marante, F. J.; González, C. *J. Chem. Thermodyn.*, 2001, 33, 689.
- McGlashan, M. L.; Stoekli, H. F. *J. Chem. Thermodyn.*, 1969, 1, 589.
- Diaz-Peña, M.; Menduñía, C. *J. Chem. Thermodyn.*, 1974, 6, 387.

0147-1503/04/01-51\$4.00

**Components:** 1. 1,3-Dichloropropane, C<sub>3</sub>H<sub>6</sub>Cl<sub>2</sub> [142-28-9]  
2. Butyl propanoate, C<sub>7</sub>H<sub>14</sub>O<sub>2</sub> [590-01-2]  
**State:** Binary system, single-phase liquid; pure components, both liquid  
**Variables:** H<sup>E</sup>, molar excess enthalpy  
x<sub>i</sub>, mole fraction of component i  
**Parameters:** T, temperature  
**Constants:** P, pressure  
**Method:** Direct calorimetric measurement of the enthalpy of mixing at constant T and P and variable x<sub>i</sub>; ref. 1

**Author(s) of table:** Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)  
**Edited by:** Skrzecz, A.; Mączynski, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

**SOURCE OF DATA**

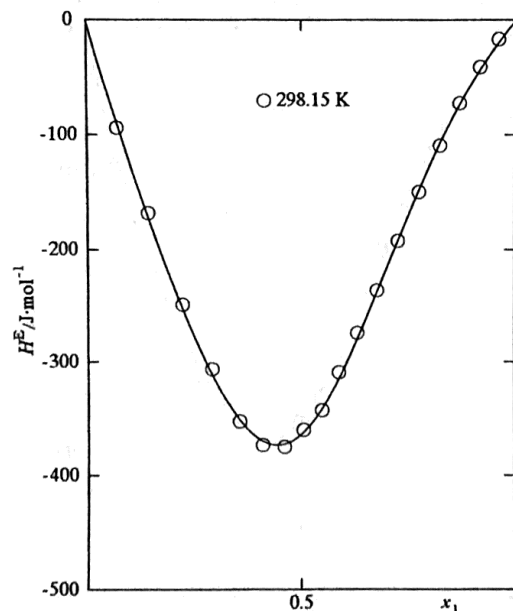
Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

**DIRECT EXPERIMENTAL VALUES**

Notes: P, 101.325 kPa

T/K = 298.15

x <sub>1</sub>	H <sup>E</sup> J·mol <sup>-1</sup>						
0.0689	-93.6						
0.1409	-167.9						
0.2223	-248.7						
0.2904	-305.8						
0.3547	-352.6						
0.4095	-373.2						
0.4599	-374.7						
0.5050	-359.6						
0.5472	-342.4						
0.5878	-309.0						
0.6314	-274.1						
0.6773	-236.1						
0.7258	-192.4						
0.7756	-149.3						
0.8241	-109.2						
0.8711	-71.8						
0.9178	-40.1						
0.9623	-16.1						



Points, direct experimental H<sup>E</sup> values, curve, H<sup>E</sup><sub>calc</sub> calculated from the equation.

**SMOOTHING EQUATION**

$$H_{\text{calc}}^E = x_1 x_2 a_1 / [1 + \sum_{i=2}^n a_i (x_1 - x_2)^{i-1}]$$

Coefficients a<sub>i</sub> in the smoothing equation, standard deviation σ<sub>d</sub>, and maximum deviation δ<sub>m</sub> determined by least-squares analysis.

T/K	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	σ <sub>d</sub>	δ <sub>m</sub>
	J·mol <sup>-1</sup>					J·mol <sup>-1</sup>	
298.15	-1450.5 (5.8)	0.4612 (0.0178)	1.176 (0.029)	0.654 (0.055)		3.4	4.6

The standard deviations σ(a<sub>i</sub>) of the coefficients a<sub>i</sub> are given in parentheses  
δ<sub>m</sub> = max |H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>|; σ<sub>d</sub> = [Σ(H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>)<sup>2</sup> / (N - n)]<sup>1/2</sup>  
N, number of direct experimental values; n, number of coefficients a<sub>i</sub>  
All direct experimental values equally weighted

**AUXILIARY INFORMATION**

**Apparatus:** Calvet type microcalorimeter, model MS-80D (Setaram, Lyon, France) with stainless steel batch mixing cell (vol. 8 cm<sup>3</sup>) and with negligible vapor phase, described in ref. 2.

**Procedure:** The microcalorimeter was calibrated electrically after each measurement by the Joule effect, as described in ref. 2. Test measurements on the cyclohexane + hexane and benzene + heptadecane systems were in agreement to within 1% (over central range of concentration) with the data reported, respectively, in refs 3 and 4.

**Materials:** 1. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 1178.45; n(D, 298.15 K) = 1.4455.  
2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 865.77; n(D, 298.15 K) = 1.4031.

**Errors:** |δT|/K = 0.02; |δx<sub>i</sub>| = 0.0005; |δH<sup>E</sup>|/J·mol<sup>-1</sup> < 20.

**REFERENCES**

1. *Int. DATA Ser., Ser. A, Guideline 3a*, 1994, 22(1).
2. Chaar, M.; Ortega, J.; Toledo-Marante, F. J.; González, C. *J. Chem. Thermodyn.*, 2001, 33, 689.
3. McGlashan, M. L.; Stoeckli, H. F. *J. Chem. Thermodyn.*, 1969, 1, 589.
4. Diaz-Peña, M.; Mendiña, C. *J. Chem. Thermodyn.*, 1974, 6, 387.

SELECTED DATA ON MIXTURES  
International DATA Series\*

1a. EXCESS ENTHALPY

National Institute of Standards and Technology, Boulder, CO 80305-3328

Compiled by Thermodynamics Research Center

**Components:** 1. 1,4-Dichlorobutane, C<sub>4</sub>H<sub>8</sub>Cl<sub>2</sub> [110-56-5]  
2. Butyl propanoate, C<sub>7</sub>H<sub>14</sub>O<sub>2</sub> [590-01-2]  
**State:** Binary system, single-phase liquid; pure components, both liquid  
**Variables:** H<sup>E</sup>, molar excess enthalpy  
x<sub>i</sub>, mole fraction of component i  
**Parameters:** T, temperature  
**Constants:** P, pressure  
**Method:** Direct calorimetric measurement of the enthalpy of mixing at constant T and P and variable x<sub>i</sub>; ref. 1

**Author(s) of table:** Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)  
**Edited by:** Skrzecz, A.; Mącznyński, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

SOURCE OF DATA

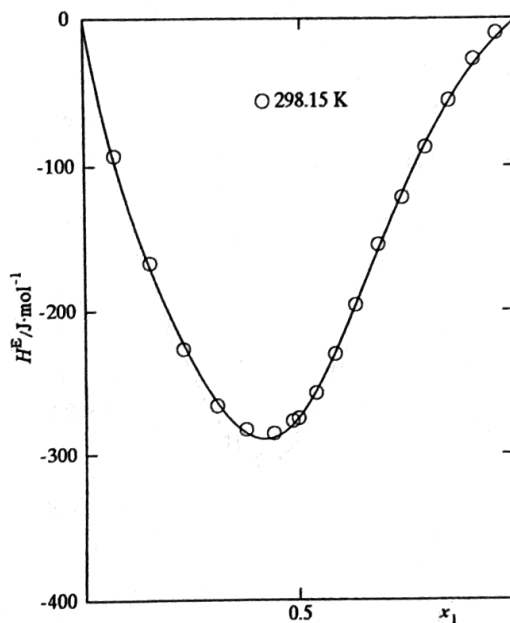
Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

DIRECT EXPERIMENTAL VALUES

Notes: P, 101.325 kPa

T/K = 298.15

x <sub>1</sub>	H <sup>E</sup> J·mol <sup>-1</sup>						
0.0693	-92.8						
0.1509	-166.7						
0.2278	-226.6						
0.3058	-265.8						
0.3742	-282.4						
0.4383	-285.0						
0.4827	-276.5						
0.4966	-274.8						
0.5382	-257.0						
0.5826	-230.3						
0.6300	-195.8						
0.6833	-153.6						
0.7386	-121.5						
0.7927	-86.8						
0.8469	-55.3						
0.9030	-27.4						
0.9554	-9.7						



Points, direct experimental H<sup>E</sup> values, curve, H<sup>E</sup><sub>calc</sub> calculated from the equation.

SMOOTHING EQUATION

$$H_{\text{calc}}^E = x_1 x_2 a_1 / [1 + \sum_{i=2}^n a_i (x_1 - x_2)^{i-1}]$$

Coefficients a<sub>i</sub> in the smoothing equation, standard deviation σ<sub>d</sub>, and maximum deviation δ<sub>m</sub> determined by least-squares analysis.

T/K	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	σ <sub>d</sub>	δ <sub>m</sub>
	J·mol <sup>-1</sup>					J·mol <sup>-1</sup>	
298.15	-1091.4 (5.0)	0.690 (0.021)	1.447 (0.039)	1.166 (0.068)		3.0	4.6

The standard deviations σa<sub>i</sub> of the coefficients a<sub>i</sub> are given in parentheses  
δ<sub>m</sub> = max |H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>|; σ<sub>d</sub> = [Σ(H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>)<sup>2</sup> / (N - n)]<sup>1/2</sup>  
N, number of direct experimental values; n, number of coefficients a<sub>i</sub>  
All direct experimental values equally weighted

AUXILIARY INFORMATION

**Apparatus:** Calvet type microcalorimeter, model MS-80D (Setaram, Lyon, France) with stainless steel batch mixing cell (vol. 8 cm<sup>3</sup>) and with negligible vapor phase, described in ref. 2.

**Procedure:** The microcalorimeter was calibrated electrically after each measurement by the Joule effect, as described in ref. 2. Test measurements on the cyclohexane + hexane and benzene + heptadecane systems were in agreement to within 1% (over central range of concentration) with the data reported, respectively, in refs 3 and 4.

**Materials:** 1. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 1133.06; n(D, 298.15 K) = 1.4522.  
2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 865.77; n(D, 298.15 K) = 1.4031.

**Errors:** |δT|/K = 0.02; |δx<sub>1</sub>| = 0.0005; |δH<sup>E</sup>|/J·mol<sup>-1</sup> < 10.

REFERENCES

1. Int. DATA Ser., Ser. A, Guideline 3a, 1994, 22(1).
2. Chaar, M.; Ortega, J.; Toledo-Marante, F. J.; González, C. *J. Chem. Thermodyn.*, 2001, 33, 689.
3. McGlashan, M. L.; Stoeckli, H. F. *J. Chem. Thermodyn.*, 1969, 1, 589.
4. Diaz-Peña, M.; Mendiña, C. *J. Chem. Thermodyn.*, 1974, 6, 387.



Compiled by Thermodynamics Research Center

**Components:** 1. 1,5-Dichloropentane, C<sub>5</sub>H<sub>10</sub>Cl<sub>2</sub> [628-76-2]  
2. Butyl propanoate, C<sub>7</sub>H<sub>14</sub>O<sub>2</sub> [590-01-2]  
**State:** Binary system, single-phase liquid; pure components, both liquid  
**Variables:** H<sup>E</sup>, molar excess enthalpy  
x<sub>i</sub>, mole fraction of component i  
**Parameters:** T, temperature  
**Constants:** P, pressure  
**Method:** Direct calorimetric measurement of the enthalpy of mixing at constant T and P and variable x<sub>i</sub>; ref. 1

**Author(s) of table:** Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)  
**Edited by:** Skrzecz, A.; Mączynski, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

SOURCE OF DATA

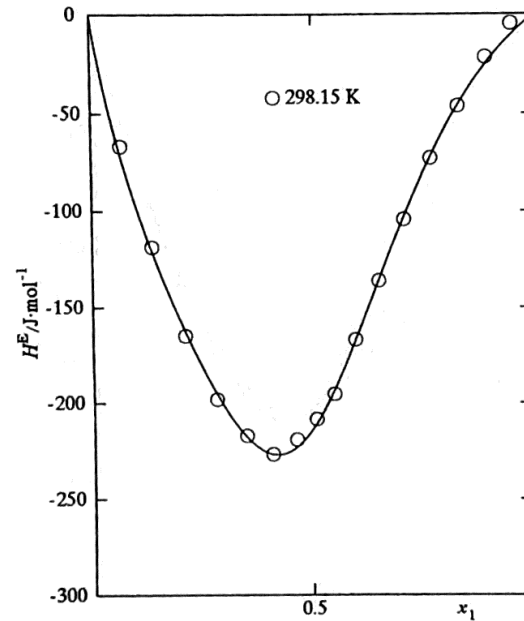
Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

DIRECT EXPERIMENTAL VALUES

Notes: P, 101.325 kPa

T/K = 298.15

x <sub>1</sub>	H <sup>E</sup> J·mol <sup>-1</sup>						
0.0659	-66.7						
0.1361	-118.3						
0.2086	-164.8						
0.2802	-198.0						
0.3470	-217.1						
0.4077	-226.4						
0.4638	-218.9						
0.5088	-208.4						
0.5502	-195.2						
0.6002	-166.7						
0.6536	-135.8						
0.7113	-103.9						
0.7703	-72.5						
0.8327	-46.0						
0.8938	-21.4						
0.9505	-4.4						



Points, direct experimental H<sup>E</sup> values, curve, H<sup>E</sup><sub>calc</sub> calculated from the equation.

SMOOTHING EQUATION

$$H_{\text{calc}}^E = x_1 x_2 a_1 / [1 + \sum_{i=2}^n a_i (x_1 - x_2)^{i-1}]$$

Coefficients a<sub>i</sub> in the smoothing equation, standard deviation σ<sub>d</sub>, and maximum deviation δ<sub>m</sub> determined by least-squares analysis.

T/K	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	σ <sub>d</sub>	δ <sub>m</sub>
	J·mol <sup>-1</sup>					J·mol <sup>-1</sup>	
298.15	-853.1 (5.7)	0.747 (0.028)	1.701 (0.059)	1.363 (0.097)		3.1	5.5

The standard deviations σ(a<sub>i</sub>) of the coefficients a<sub>i</sub> are given in parentheses  
δ<sub>m</sub> = max |H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>|; σ<sub>d</sub> = [Σ(H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>)<sup>2</sup> / (N - n)]<sup>1/2</sup>  
N, number of direct experimental values; n, number of coefficients a<sub>i</sub>  
All direct experimental values equally weighted

AUXILIARY INFORMATION

**Apparatus:** Calvet type microcalorimeter, model MS-80D (Setaram, Lyon, France) with stainless steel batch mixing cell (vol. 8 cm<sup>3</sup>) and with negligible vapor phase, described in ref. 2.

**Procedure:** The microcalorimeter was calibrated electrically after each measurement by the Joule effect, as described in ref. 2. Test measurements on the cyclohexane + hexane and benzene + heptadecane systems were in agreement to within 1% (over central range of concentration) with the data reported, respectively, in refs 3 and 4.

**Materials:** 1. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 1095.27; n<sub>D</sub>(298.15 K) = 1.4545.  
2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 865.77; n<sub>D</sub>(298.15 K) = 1.4031.

**Errors:** |δT|/K = 0.02; |δx<sub>1</sub>| = 0.0005; |δH<sup>E</sup>|/J·mol<sup>-1</sup> < 10.

REFERENCES

1. *Int. DATA Ser., Ser. A, Guideline 3a, 1994*, 22(1).
2. Chaar, M.; Ortega, J.; Toledo-Marante, F. J.; González, C. *J. Chem. Thermodyn.*, 2001, 33, 689.
3. McGlashan, M. L.; Stoeckli, H. F. *J. Chem. Thermodyn.*, 1969, 1, 589.
4. Diaz-Peña, M.; Mendiña, C. *J. Chem. Thermodyn.*, 1974, 6, 387.

SELECTED DATA ON MIXTURES  
International DATA Series\*

1a. EXCESS ENTHALPY

National Institute of Standards and Technology, Boulder, CO 80305-3328

Compiled by Thermodynamics Research Center

**Components:** 1. 1,6-Dichlorohexane, C<sub>6</sub>H<sub>12</sub>Cl<sub>2</sub> [2163-00-0]  
2. Butyl propanoate, C<sub>7</sub>H<sub>14</sub>O<sub>2</sub> [590-01-2]  
**State:** Binary system, single-phase liquid; pure components, both liquid  
**Variables:** H<sup>E</sup>, molar excess enthalpy  
x<sub>i</sub>, mole fraction of component i  
**Parameters:** T, temperature  
**Constants:** P, pressure  
**Method:** Direct calorimetric measurement of the enthalpy of mixing at constant T and P and variable x<sub>i</sub>; ref. 1

**Author(s) of table:** Ortega, J. (Laboratorio de Termodinámica y Físicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)  
**Edited by:** Skrzecz, A.; Mączynski, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

SOURCE OF DATA

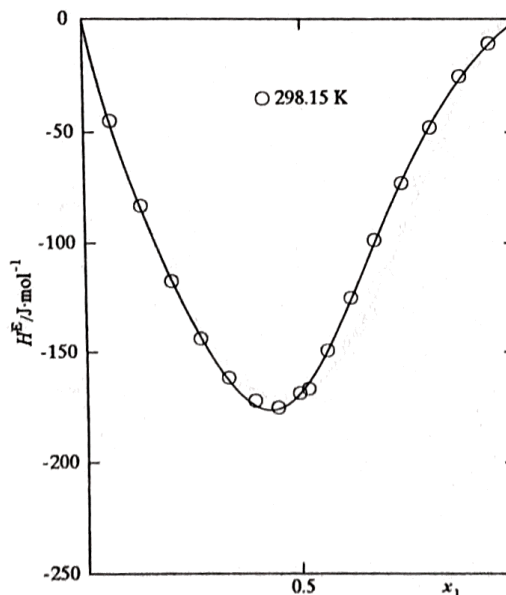
Ortega, J. (Laboratorio de Termodinámica y Físicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

DIRECT EXPERIMENTAL VALUES

Notes: P, 101.325 kPa

T/K = 298.15

x <sub>1</sub>	H <sup>E</sup> J·mol <sup>-1</sup>						
0.0612	-45.0						
0.1285	-83.3						
0.1986	-117.0						
0.2651	-143.6						
0.3292	-161.7						
0.3914	-172.2						
0.4449	-175.3						
0.4955	-168.8						
0.5164	-166.7						
0.5612	-148.9						
0.6162	-124.8						
0.6723	-98.8						
0.7354	-72.8						
0.8017	-47.7						
0.8698	-25.2						
0.9375	-10.6						



Points, direct experimental H<sup>E</sup> values, curve, H<sup>E</sup><sub>calc</sub> calculated from the equation.

SMOOTHING EQUATION

$$H_{\text{calc}}^E = x_1 x_2 a_1 / [1 + \sum_{i=2}^n a_i (x_1 - x_2)^{i-1}]$$

Coefficients a<sub>i</sub> in the smoothing equation, standard deviation σ<sub>d</sub>, and maximum deviation δ<sub>m</sub> determined by least-squares analysis.

T/K	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	σ <sub>d</sub>	δ <sub>m</sub>
	J·mol <sup>-1</sup>						
298.15	-671.5 (2.3)	0.6745 (0.0155)	1.655 (0.031)	1.251 (0.052)		1.3	2.9

The standard deviations σ(a<sub>i</sub>) of the coefficients a<sub>i</sub> are given in parentheses  
δ<sub>m</sub> = max |H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>|; σ<sub>d</sub> = [Σ(H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>)<sup>2</sup> / (N - n)]<sup>1/2</sup>  
N, number of direct experimental values; n, number of coefficients a<sub>i</sub>  
All direct experimental values equally weighted

AUXILIARY INFORMATION

**Apparatus:** Calvet type microcalorimeter, model MS-80D (Setaram, Lyon, France) with stainless steel batch mixing cell (vol. 8 cm<sup>3</sup>) and with negligible vapor phase, described in ref. 2.

**Procedure:** The microcalorimeter was calibrated electrically after each measurement by the Joule effect, as described in ref. 2. Test measurements on the cyclohexane + hexane and benzene + heptadecane systems were in agreement to within 1% (over central range of concentration) with the data reported, respectively, in refs 3 and 4.

**Materials:** 1. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 1067.59; n(D, 298.15 K) = 1.4555.  
2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 865.77; n(D, 298.15 K) = 1.4031.

**Errors:** |δT|/K = 0.02; |δx<sub>1</sub>| = 0.0005; |δH<sup>E</sup>|/J·mol<sup>-1</sup> < 5.

REFERENCES

1. *Int. DATA Ser., Ser. A, Guideline 3a*, 1994, 22(1).
2. Chaar, M.; Ortega, J.; Toledo-Marante, F. J.; González, C. *J. Chem. Thermodyn.*, 2001, 33, 689.
3. McGlashan, M. L.; Stoeckli, H. F. *J. Chem. Thermodyn.*, 1969, 1, 589.
4. Diaz-Peña, M.; Mendiña, C. *J. Chem. Thermodyn.*, 1974, 6, 387.

**Components:** 1. 1,2-Dichloroethane, C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub> [107-06-2]  
 2. Butyl butanoate, C<sub>8</sub>H<sub>16</sub>O<sub>2</sub> [109-21-7]  
**State:** Binary system, single-phase liquid; pure components, both liquid  
**Variables:** H<sup>E</sup>, molar excess enthalpy  
 x<sub>i</sub>, mole fraction of component i  
**Parameters:** T, temperature  
**Constants:** P, pressure  
**Method:** Direct calorimetric measurement of the enthalpy of mixing at constant T and P and variable x<sub>i</sub>; ref. 1

**Author(s) of table:** Ortega, J. (Laboratorio de Termodinámica y Físicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)  
**Edited by:** Skrzecz, A.; Mącztyński, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

SOURCE OF DATA

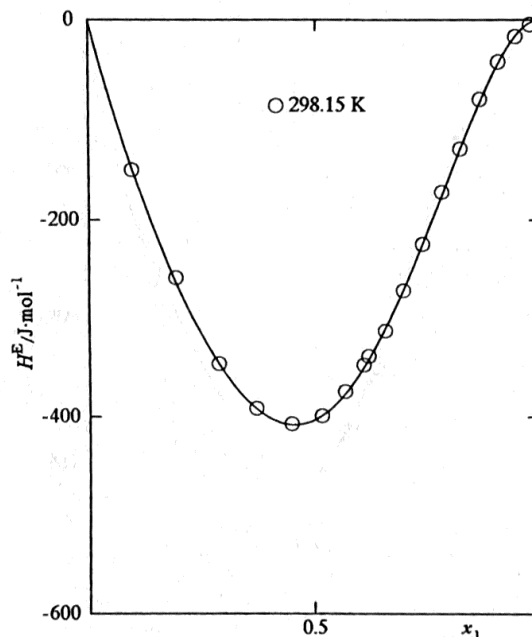
Ortega, J. (Laboratorio de Termodinámica y Físicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

DIRECT EXPERIMENTAL VALUES

Notes: P, 101.325 kPa

T/K = 298.15

x <sub>1</sub>	H <sup>E</sup> J·mol <sup>-1</sup>						
0.0951	-148.4						
0.1926	-257.2						
0.2884	-346.3						
0.3702	-391.4						
0.4490	-407.3						
0.5166	-398.9						
0.5699	-374.0						
0.6113	-347.7						
0.6213	-338.2						
0.6592	-312.1						
0.6988	-270.3						
0.7402	-224.0						
0.7810	-171.2						
0.8222	-126.7						
0.8633	-77.7						
0.9033	-40.7						
0.9402	-15.9						
0.9727	-4.0						



Points, direct experimental H<sup>E</sup> values, curve, H<sup>E</sup><sub>calc</sub> calculated from the equation.

SMOOTHING EQUATION

$$H_{\text{calc}}^E = x_1 x_2 \sum_{i=1}^n a_i (x_1 - x_2)^{i-1}$$

Coefficients a<sub>i</sub> in the smoothing equation, standard deviation σ<sub>d</sub>, and maximum deviation δ<sub>m</sub> determined by least-squares analysis.

T/K	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	σ <sub>d</sub>	δ <sub>m</sub>
	J·mol <sup>-1</sup>						
298.15	-1609.0 (4.3)	430.5 (16.3)	817 (21)	498 (43)		2.4	4.2

The standard deviations σ(a<sub>i</sub>) of the coefficients a<sub>i</sub> are given in parentheses  
 δ<sub>m</sub> = max |H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>|; σ<sub>d</sub> = [Σ(H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>)<sup>2</sup> / (N - n)]<sup>1/2</sup>  
 N, number of direct experimental values; n, number of coefficients a<sub>i</sub>  
 All direct experimental values equally weighted

AUXILIARY INFORMATION

**Apparatus:** Calvet type microcalorimeter, model MS-80D (Setaram, Lyon, France) with stainless steel batch mixing cell (vol. 8 cm<sup>3</sup>) and with negligible vapor phase, described in ref. 2.

**Procedure:** The microcalorimeter was calibrated electrically after each measurement by the Joule effect, as described in ref. 2. Test measurements on the cyclohexane + hexane and benzene + heptadecane systems were in agreement to within 1% (over central range of concentration) with the data reported, respectively, in refs 3 and 4.

**Materials:** 1. Fluka AG (Busch, Switzerland) "puriss" grade material of stated GLC purity > 99.5 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 1245.38; n(D, 298.15 K) = 1.4422.  
 2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 98 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 785.18; n(D, 298.15 K) = 1.3595.

**Errors:** |δT|/K = 0.02; |δx<sub>1</sub>| = 0.0005; |δH<sup>E</sup>|/J·mol<sup>-1</sup> < 10.

REFERENCES

1. *Int. DATA Ser., Ser. A, Guideline 3a*, 1994, 22(1).
2. Chaar, M.; Ortega, J.; Toledo-Marante, F. J.; González, C. *J. Chem. Thermodyn.*, 2001, 33, 689.
3. McGlashan, M. L.; Stoeckli, H. F. *J. Chem. Thermodyn.*, 1969, 1, 589.
4. Diaz-Peña, M.; Mendiña, C. *J. Chem. Thermodyn.*, 1974, 6, 387.

Compiled by Thermodynamics Research Center

0147-1503/4/01-57\$4.00

**Components:** 1. 1,3-Dichloropropane, C<sub>3</sub>H<sub>6</sub>Cl<sub>2</sub> [142-28-9]  
2. Butyl butanoate, C<sub>8</sub>H<sub>16</sub>O<sub>2</sub> [109-21-7]  
**State:** Binary system, single-phase liquid; pure components, both liquid  
**Variables:** H<sup>E</sup>, molar excess enthalpy  
x<sub>i</sub>, mole fraction of component i  
**Parameters:** T, temperature  
**Constants:** P, pressure  
**Method:** Direct calorimetric measurement of the enthalpy of mixing at constant T and P and variable x<sub>i</sub>; ref. 1

**Author(s) of table:** Ortega, J. (Laboratorio de Termodinámica y Físicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)  
**Edited by:** Skrzecz, A.; Mączynski, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

SOURCE OF DATA

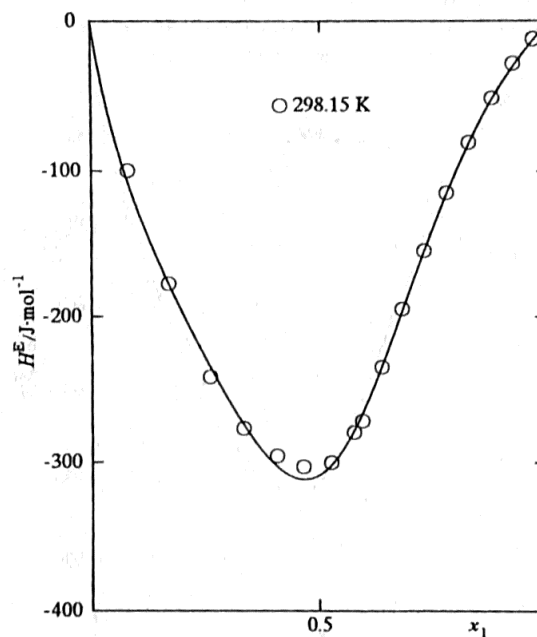
Ortega, J. (Laboratorio de Termodinámica y Físicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

DIRECT EXPERIMENTAL VALUES

Notes: P, 101.325 kPa

T/K = 298.15

x <sub>1</sub>	H <sup>E</sup> J·mol <sup>-1</sup>						
0.0802	-99.6						
0.1697	-177.1						
0.2597	-241.3						
0.3334	-276.5						
0.4072	-295.1						
0.4668	-302.6						
0.5274	-299.9						
0.5789	-279.1						
0.5970	-271.5						
0.6399	-234.4						
0.6849	-194.7						
0.7319	-154.4						
0.7795	-115.0						
0.8282	-80.6						
0.8763	-50.6						
0.9212	-27.5						
0.9641	-11.3						



Points, direct experimental H<sup>E</sup> values, curve, H<sup>E</sup><sub>calc</sub> calculated from the equation.

SMOOTHING EQUATION

$$H_{\text{calc}}^E = x_1 x_2 a_1 / [1 + \sum_{i=2}^n a_i (x_1 - x_2)^{i-1}]$$

Coefficients a<sub>i</sub> in the smoothing equation, standard deviation σ<sub>d</sub>, and maximum deviation δ<sub>m</sub> determined by least-squares analysis.

T/K	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	σ <sub>d</sub>	δ <sub>m</sub>
	J·mol <sup>-1</sup>					J·mol <sup>-1</sup>	
298.15	-1231.0 (8.5)	0.278 (0.030)	1.350 (0.052)	1.470 (0.094)		4.7	8.1

The standard deviations σ(a<sub>i</sub>) of the coefficients a<sub>i</sub> are given in parentheses  
δ<sub>m</sub> = max |H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>|; σ<sub>d</sub> = [Σ(H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>)<sup>2</sup> / (N - n)]<sup>1/2</sup>  
N, number of direct experimental values; n, number of coefficients a<sub>i</sub>  
All direct experimental values equally weighted

AUXILIARY INFORMATION

**Apparatus:** Calvet type microcalorimeter, model MS-80D (Setaram, Lyon, France) with stainless steel batch mixing cell (vol. 8 cm<sup>3</sup>) and with negligible vapor phase, described in ref. 2.

**Procedure:** The microcalorimeter was calibrated electrically after each measurement by the Joule effect, as described in ref. 2. Test measurements on the cyclohexane + hexane and benzene + heptadecane systems were in agreement to within 1% (over central range of concentration) with the data reported, respectively, in refs 3 and 4.

**Materials:** 1. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 1178.45; n(D, 298.15 K) = 1.4455.  
2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 98 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 785.18; n(D, 298.15 K) = 1.3595.

**Errors:** |δT|/K = 0.02; |δx<sub>1</sub>| = 0.0005; |δH<sup>E</sup>|/J·mol<sup>-1</sup> < 10.

REFERENCES

1. *Int. DATA Ser., Ser. A, Guideline 3a*, 1994, 22(1).
2. Chaar, M.; Ortega, J.; Toledo-Marante, F. J.; González, C. *J. Chem. Thermodyn.*, 2001, 33, 689.
3. McGlashan, M. L.; Stoeckli, H. F. *J. Chem. Thermodyn.*, 1969, 1, 589.
4. Diaz-Peña, M.; Mendiña, C. *J. Chem. Thermodyn.*, 1974, 6, 387.

**SELECTED DATA ON MIXTURES**  
**International DATA Series\***

**1a. EXCESS ENTHALPY**

Compiled by Thermodynamics Research Center

National Institute of Standards and Technology, Boulder, CO 80305-3328

**Components:** 1. 1,4-Dichlorobutane, C<sub>4</sub>H<sub>8</sub>Cl<sub>2</sub> [110-56-5]  
2. Butyl butanoate, C<sub>8</sub>H<sub>16</sub>O<sub>2</sub> [109-21-7]  
**State:** Binary system, single-phase liquid; pure components, both liquid  
**Variables:** H<sup>E</sup>, molar excess enthalpy  
x<sub>i</sub>, mole fraction of component i  
**Parameters:** T, temperature  
**Constants:** P, pressure  
**Method:** Direct calorimetric measurement of the enthalpy of mixing at constant T and P and variable x<sub>i</sub>; ref. 1

**Author(s) of table:** Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)  
**Edited by:** Skrzecz, A.; Mączynski, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

**SOURCE OF DATA**

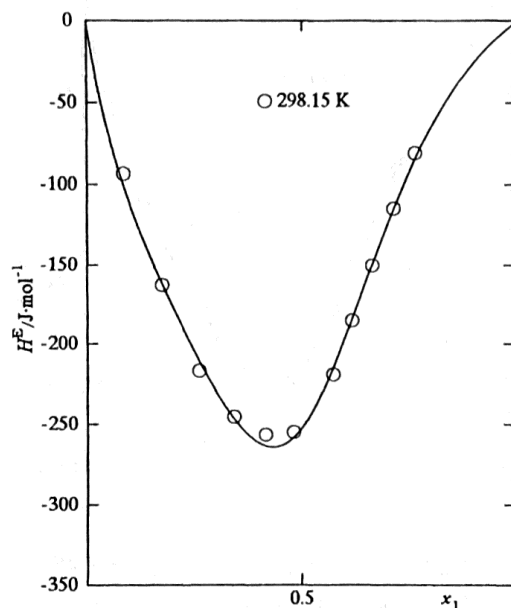
Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

**DIRECT EXPERIMENTAL VALUES**

Notes: P, 101.325 kPa

T/K = 298.15

x <sub>1</sub>	H <sup>E</sup> /J·mol <sup>-1</sup>						
0.0843	-93.3						
0.1738	-162.7						
0.2598	-216.2						
0.3411	-245.2						
0.4158	-256.2						
0.4811	-254.6						
0.5754	-218.8						
0.6204	-184.9						
0.6677	-150.3						
0.7173	-114.4						
0.7666	-80.8						



Points, direct experimental H<sup>E</sup> values, curve, H<sup>E</sup><sub>calc</sub> calculated from the equation.

**SMOOTHING EQUATION**

$$H_{\text{calc}}^E = x_1 x_2 a_1 / [1 + \sum_{i=2}^n a_i (x_1 - x_2)^{i-1}]$$

Coefficients a<sub>i</sub> in the smoothing equation, standard deviation σ<sub>d</sub>, and maximum deviation δ<sub>m</sub> determined by least-squares analysis.

T/K	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	σ <sub>d</sub>	δ <sub>m</sub>
	J·mol <sup>-1</sup>						
298.15	-1008.4 (12.0)	0.675 (0.042)	1.8968 (0.125)	1.685 (0.195)		5.1	6.9

The standard deviations σ(a<sub>i</sub>) of the coefficients a<sub>i</sub> are given in parentheses  
δ<sub>m</sub> = max |H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>|; σ<sub>d</sub> = [Σ(H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>)<sup>2</sup>/(N - n)]<sup>1/2</sup>  
N, number of direct experimental values; n, number of coefficients a<sub>i</sub>  
All direct experimental values equally weighted

**AUXILIARY INFORMATION**

**Apparatus:** Calvet type microcalorimeter, model MS-80D (Setaram, Lyon, France) with stainless steel batch mixing cell (vol. 8 cm<sup>3</sup>) and with negligible vapor phase, described in ref. 2.

**Procedure:** The microcalorimeter was calibrated electrically after each measurement by the Joule effect, as described in ref. 2. Test measurements on the cyclohexane + hexane and benzene + heptadecane systems were in agreement to within 1% (over central range of concentration) with the data reported, respectively, in refs 3 and 4.

**Materials:** 1. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 1133.06; n(D, 298.15 K) = 1.4522.  
2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 98 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 785.18; n(D, 298.15 K) = 1.3595.

**Errors:** |δT|/K = 0.02; |δx<sub>1</sub>| = 0.0005; |δH<sup>E</sup>|/J·mol<sup>-1</sup> < 20.

**REFERENCES**

1. *Int. DATA Ser., Ser. A, Guideline 3a*, 1994, 22(1).
2. Chaar, M.; Ortega, J.; Toledo-Marante, F. J.; González, C. *J. Chem. Thermodyn.*, 2001, 33, 689.
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4. Diaz-Peña, M.; Menduina, C. *J. Chem. Thermodyn.*, 1974, 6, 387.

SELECTED DATA ON MIXTURES

International DATA Series\*

1a. EXCESS ENTHALPY

National Institute of Standards and Technology, Boulder, CO 80305 -3328

Compiled by Thermodynamics Research Center

**Components:** 1. 1,5-Dichloropentane, C<sub>5</sub>H<sub>10</sub>Cl<sub>2</sub> [628-76-2]  
 2. Butyl butanoate, C<sub>8</sub>H<sub>16</sub>O<sub>2</sub> [109-21-7]  
**State:** Binary system, single-phase liquid; pure components, both liquid  
**Variables:**  $H^E$ , molar excess enthalpy  
 $x_i$ , mole fraction of component  $i$   
**Parameters:**  $T$ , temperature  
**Constants:**  $P$ , pressure  
**Method:** Direct calorimetric measurement of the enthalpy of mixing at constant  $T$  and  $P$  and variable  $x_i$ ; ref. 1

**Author(s) of table:** Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)  
**Edited by:** Skrzecz, A.; Mącztyński, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

SOURCE OF DATA

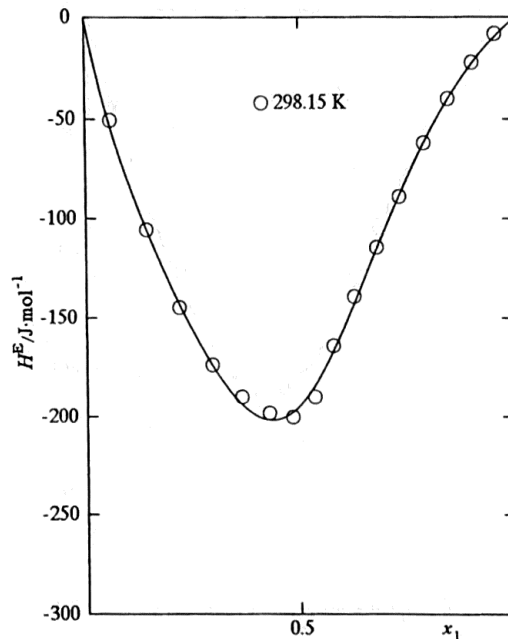
Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

DIRECT EXPERIMENTAL VALUES

Notes:  $P$ , 101.325 kPa

$T/K = 298.15$

$x_1$	$H^E$ J·mol <sup>-1</sup>						
0.0585	-50.3						
0.1414	-105.3						
0.2179	-144.6						
0.2951	-173.6						
0.3649	-189.9						
0.4290	-197.9						
0.4851	-200.1						
0.5365	-189.8						
0.5818	-164.1						
0.6305	-138.9						
0.6825	-114.4						
0.7358	-88.5						
0.7916	-61.8						
0.8479	-39.9						
0.9034	-21.9						
0.9556	-7.9						



Points, direct experimental  $H^E$  values, curve,  $H^E_{\text{calc}}$  calculated from the equation.

SMOOTHING EQUATION

$$H^E_{\text{calc}} = x_1 x_2 a_1 / [1 + \sum_{l=2}^n a_l (x_1 - x_2)^{l-1}]$$

Coefficients  $a_l$  in the smoothing equation, standard deviation  $\sigma_d$ , and maximum deviation  $\delta_m$  determined by least-squares analysis.

$T/K$	$a_1$	$a_2$	$a_3$	$a_4$	$a_5$	$\sigma_d$	$\delta_m$
	J·mol <sup>-1</sup>					J·mol <sup>-1</sup>	
298.15	-776.6 (5.3)	0.565 (0.029)	1.490 (0.054)	1.246 (0.094)		2.9	5.8

The standard deviations  $\sigma(a_i)$  of the coefficients  $a_i$  are given in parentheses  
 $\delta_m = \max |H^E_{\text{calc}} - H^E|$ ;  $\sigma_d = [\sum (H^E_{\text{calc}} - H^E)^2 / (N - n)]^{1/2}$   
 $N$ , number of direct experimental values;  $n$ , number of coefficients  $a_i$   
 All direct experimental values equally weighted

AUXILIARY INFORMATION

**Apparatus:** Calvet type microcalorimeter, model MS-80D (Setaram, Lyon, France) with stainless steel batch mixing cell (vol. 8 cm<sup>3</sup>) and with negligible vapor phase, described in ref. 2.  
**Procedure:** The microcalorimeter was calibrated electrically after each measurement by the Joule effect, as described in ref. 2. Test measurements on the cyclohexane + hexane and benzene + heptadecane systems were in agreement to within 1% (over central range of concentration) with the data reported, respectively, in refs 3 and 4.  
**Materials:** 1. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification;  $\rho(298.15 \text{ K})/\text{kg}\cdot\text{m}^{-3} = 1095.27$ ;  $n(D, 298.15 \text{ K}) = 1.4545$ .  
 2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 98 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification;  $\rho(298.15 \text{ K})/\text{kg}\cdot\text{m}^{-3} = 785.18$ ;  $n(D, 298.15 \text{ K}) = 1.3595$ .  
**Errors:**  $|\delta T|/K = 0.02$ ;  $|\delta x_1| = 0.0005$ ;  $|\delta H^E|/\text{J}\cdot\text{mol}^{-1} < 10$ .

REFERENCES

1. *Int. DATA Ser., Ser. A, Guideline 3a*, 1994, 22(1).
2. Chaar, M.; Ortega, J.; Toledo-Marante, F. J.; González, C. *J. Chem. Thermodyn.*, 2001, 33, 689.
3. McGlashan, M. L.; Stoeckli, H. F. *J. Chem. Thermodyn.*, 1969, 1, 589.
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Int. DATA Ser., Sel. Data Mixtures, Ser. A 2004, 32(1), 46-60

**Components:** 1. 1,6-Dichlorohexane, C<sub>6</sub>H<sub>12</sub>Cl<sub>2</sub> [2163-00-0]  
2. Butyl butanoate, C<sub>8</sub>H<sub>16</sub>O<sub>2</sub> [109-21-7]  
**State:** Binary system, single-phase liquid; pure components, both liquid  
**Variables:** H<sup>E</sup>, molar excess enthalpy  
x<sub>i</sub>, mole fraction of component i  
**Parameters:** T, temperature  
**Constants:** P, pressure  
**Method:** Direct calorimetric measurement of the enthalpy of mixing at constant T and P and variable x<sub>i</sub>; ref. 1

**Author(s) of table:** Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, 35071 Las Palmas de Gran Canaria, Canary Islands, Spain)  
**Edited by:** Skrzecz, A.; Mączynski, A. (Instytut Chemii Fizycznej, Polska Akademia Nauk, ul. Kasprzaka 44/52, 01-224 Warszawa, Poland)

SOURCE OF DATA

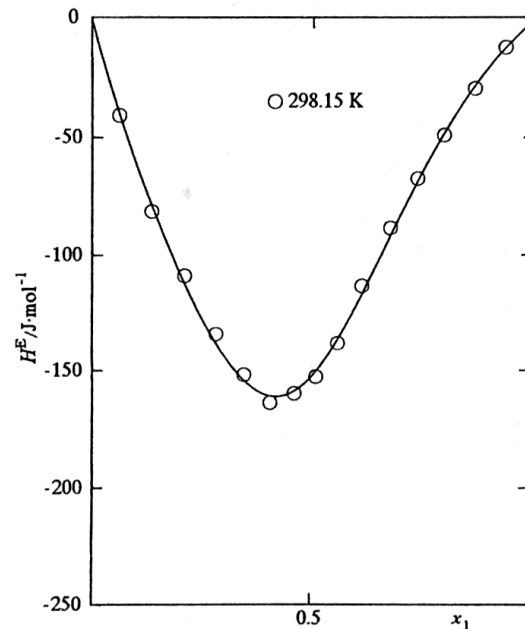
Ortega, J. (Laboratorio de Termodinámica y Fisicoquímica, Escuela Superior de Ingenieros Industriales, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain); FIRST PUBLISHED RESULTS

DIRECT EXPERIMENTAL VALUES

Notes: P, 101.325 kPa

T/K = 298.15

x <sub>1</sub>	H <sup>E</sup> J·mol <sup>-1</sup>					
0.0611	-40.7					
0.1360	-81.1					
0.2102	-108.7					
0.2828	-133.9					
0.3479	-151.7					
0.4070	-163.6					
0.4633	-159.5					
0.5130	-152.5					
0.5620	-137.8					
0.6160	-113.0					
0.6777	-88.3					
0.7390	-67.1					
0.7970	-48.9					
0.8639	-29.4					
0.9325	-12.4					



Points, direct experimental H<sup>E</sup> values, curve, H<sup>E</sup><sub>calc</sub> calculated from the equation.

SMOOTHING EQUATION

$$H_{\text{calc}}^E = x_1 x_2 a_1 / [1 + \sum_{i=2}^n a_i (x_1 - x_2)^{i-1}]$$

Coefficients a<sub>i</sub> in the smoothing equation, standard deviation σ<sub>d</sub>, and maximum deviation δ<sub>m</sub> determined by least-squares analysis.

T/K	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	σ <sub>d</sub>	δ <sub>m</sub>
	J·mol <sup>-1</sup>						
298.15	-609.3 (5.2)	0.671 (0.036)	1.384 (0.067)	0.856 (0.116)		2.8	3.5

The standard deviations σ(a<sub>i</sub>) of the coefficients a<sub>i</sub> are given in parentheses  
δ<sub>m</sub> = max |H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>|; σ<sub>d</sub> = [Σ(H<sup>E</sup><sub>calc</sub> - H<sup>E</sup>)<sup>2</sup> / (N - n)]<sup>1/2</sup>  
N, number of direct experimental values; n, number of coefficients a<sub>i</sub>  
All direct experimental values equally weighted

AUXILIARY INFORMATION

**Apparatus:** Calvet type microcalorimeter, model MS-80D (Setaram, Lyon, France) with stainless steel batch mixing cell (vol. 8 cm<sup>3</sup>) and with negligible vapor phase, described in ref. 2.

**Procedure:** The microcalorimeter was calibrated electrically after each measurement by the Joule effect, as described in ref. 2. Test measurements on the cyclohexane + hexane and benzene + heptadecane systems were in agreement to within 1% (over central range of concentration) with the data reported, respectively, in refs 3 and 4.

**Materials:** 1. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 99 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 1067.59; n<sub>D</sub>(298.15 K) = 1.4555.  
2. Aldrich Chem. Co., Inc. (Milwaukee, WI, USA), material of stated GLC purity > 98 mole %; degassed ultrasonically, dried over molecular sieves 3A, used without further purification; ρ(298.15 K)/kg·m<sup>-3</sup> = 785.18; n<sub>D</sub>(298.15 K) = 1.3595.

**Errors:** |δT|/K = 0.02; |δx<sub>1</sub>| = 0.0005; |δH<sup>E</sup>|/J·mol<sup>-1</sup> < 5.

REFERENCES

1. *Int. DATA Ser., Ser. A, Guideline 3a*, 1994, 22(1).
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