Solubility of syngas components in water acetic acid and alcohol using new standard fugacity methodology

Torli, Mauro; Geer, Luydmila; Kontogeorgis, Georgios M.; Fosbøl, Philip L.

Published in:
Industrial and Engineering Chemistry Research

Link to article, DOI:
10.1021/acs.iecr.8b03954

Publication date:
2018

Document Version
Peer reviewed version

Supporting information

In the tables below, from 1 to 15, are listed the number of points involved in the final model parameter estimation and the number of relevant experimental measurement reported in the original papers. Concentration intervals, temperature and pressure ranges are included as well.

Table 1: Literature data for CO_2-H_2O system in different experimental ranges

Gas solubility [mol/mol total]	Temperature T[K]	Pressure P[bar]	Data points[a]	Reference
$6.30\cdot10^{-4}$-$2.26\cdot10^{-2}$	298-448	10.9-175.3	38	1
$4.99\cdot10^{-4}$-$2.58\cdot10^{-2}$	289-533	6.9-202.7	29(30)	2
$5.13\cdot10^{-4}$-$7.55\cdot10^{-4}$	290-303	atmospheric	14	3
$2.53\cdot10^{-4}$-$6.83\cdot10^{-4}$	303-333	atmospheric	1(7)	4
$2.64\cdot10^{-5}$-$8.26\cdot10^{-4}$	285-350	0.13-0.97	49(54)	5
$8.00\cdot10^{-3}$-$2.98\cdot10^{-1}$	323-623	200-3500	12(104)[b,c]	6
$4.00\cdot10^{-3}$-$2.50\cdot10^{-1}$	383-623	100-1500	20(116)[b,c]	7
$5.00\cdot10^{-4}$-$7.60\cdot10^{-3}$	323-473	1.5-53.9	33	8
$1.65\cdot10^{-2}$-$2.26\cdot10^{-2}$	323	68.2-176.8	8	9
$3.90\cdot10^{-4}$-$1.03\cdot10^{-2}$	373-473	3.2-81.1	49	10
$1.54\cdot10^{-2}$-$2.04\cdot10^{-2}$	348-421	101.8-197.2	5(7)	11
$4.60\cdot10^{-3}$-$2.15\cdot10^{-2}$	304-313	10.1-60.8	17(20)	12
$8.00\cdot10^{-3}$-$2.17\cdot10^{-2}$	323-353	40.5-141.1	29	13
$1.82\cdot10^{-3}$-$2.80\cdot10^{-2}$	278-318	4.6-79.6	47	14
$3.80\cdot10^{-4}$-$3.65\cdot10^{-3}$	288-323	0.92-4.7	47(49)	15
$6.40\cdot10^{-3}$-$2.27\cdot10^{-2}$	323-373	20.6-202.0	8	16
$2.00\cdot10^{-4}$-$3.32\cdot10^{-3}$	298-335	0.60-5.3	17(50)	17
$3.75\cdot10^{-4}$-$9.12\cdot10^{-3}$	313-333	1.2-25.1	12(17)	18
$1.26\cdot10^{-3}$-$2.22\cdot10^{-2}$	298-393	5.4-51.4	30	19
$4.00\cdot10^{-4}$-$2.30\cdot10^{-3}$	298-323	1.2-4.1	9	20
$8.53\cdot10^{-3}$-$2.64\cdot10^{-2}$	273-298	10.1-45.6	6(12)	21
$1.56\cdot10^{-2}$-$2.10\cdot10^{-2}$	323-348	101.3-152.0	4	22
$2.20\cdot10^{-3}$-$1.66\cdot10^{-2}$	353-471	20.4-102.1	30(33)	23
$1.40\cdot10^{-2}$-$2.70\cdot10^{-2}$	313	40-100	2	24
$2.08\cdot10^{-2}$-$2.51\cdot10^{-2}$	323	101-310	2(3)	25
$1.63\cdot10^{-4}$-$5.69\cdot10^{-4}$	278-338	0.49-0.84	10	26
$1.56\cdot10^{-2}$-$2.34\cdot10^{-2}$	278-283	20.0-37.0	5(6)	27
$6.60\cdot10^{-3}$-$1.47\cdot10^{-2}$	293	10.1-25.3	4	28
$7.64\cdot10^{-3}$-$1.26\cdot10^{-2}$	297-370	15.5-83.4	26	29
$4.96\cdot10^{-3}$-$1.80\cdot10^{-2}$	304-313	10.1-45.9	6(8)	30
$3.98\cdot10^{-4}$-$6.87\cdot10^{-4}$	293-313	atmospheric	4	31
$1.53\cdot10^{-2}$-$3.02\cdot10^{-4}$	324-376	106-499	3(7)[c]	32
$1.34\cdot10^{-2}$-$2.46\cdot10^{-2}$	353-393	100-300	5	33
$1.70\cdot10^{-3}$-$4.60\cdot10^{-3}$	298-299	2.6-7.5	6(7)	34
$1.10\cdot10^{-2}$-$2.19\cdot10^{-2}$	374-375	72.1-272.6	5	35
$3.52\cdot10^{-3}$-$1.54\cdot10^{-2}$	323	10.6-58.0	7	36
$5.17\cdot10^{-3}$-$2.62\cdot10^{-2}$	293-373	20-167	29(55)	37
$4.49\cdot10^{-4}$-$6.63\cdot10^{-4}$	293-307	atmospheric	8	38
$2.77\cdot10^{-3}$-$1.64\cdot10^{-2}$	293-303	4.9-29.4	8(9)	39
$4.10\cdot10^{-3}$-$3.02\cdot10^{-2}$	323-373	25-709	20(29)[c]	40
$9.32\cdot10^{-3}$-$2.98\cdot10^{-2}$	291-313	25-506	15(22)[c]	41
$3.11\cdot10^{-4}$-$1.38\cdot10^{-3}$	273-323	atmospheric	18	42
$1.52\cdot10^{-4}$-$8.43\cdot10^{-4}$	286-348	atmospheric	19	43
$2.24\cdot10^{-3}$-$2.12\cdot10^{-2}$	450-607	25.2-198.7	10(15)[b]	44
$1.97\cdot10^{-3}$-$1.70\cdot10^{-2}$	303-353	9.3-39.3	13	45
$4.54\cdot10^{-4}$-$1.32\cdot10^{-3}$	274-308	atmospheric	8	46
$3.00\cdot10^{-5}$-$2.48\cdot10^{-2}$	313-393	0.95-92.6	18(39)	47
$5.38\cdot10^{-4}$-$1.64\cdot10^{-2}$	283-303	1.0-20.3	15	48
$1.07\cdot10^{-2}$-$5.42\cdot10^{-2}$	298-423	100-800	6(17)[c]	49
$3.80\cdot10^{-3}$-$3.00\cdot10^{-2}$	374-393	23-703	15(26)[c]	50
$4.30\cdot10^{-3}$-$3.20\cdot10^{-2}$	285-373	25-709	43(72)[c]	51
$5.90\cdot10^{-4}$-$1.08\cdot10^{-3}$	298	0.99-1.80	10	52
$6.06\cdot10^{-4}$-$1.08\cdot10^{-3}$	298	1.01-1.80	12	53
$2.09\cdot10^{-4}$-$6.09\cdot10^{-4}$	298	0.35-1.02	8(10)	54
$2.18\cdot10^{-4}$-$7.90\cdot10^{-4}$	298	0.36-1.32	15(18)	55
$7.13\cdot10^{-4}$-$1.44\cdot10^{-3}$	273-293	atmospheric	21	56[d]
$7.64\cdot10^{-4}$-$3.63\cdot10^{-3}$	288	0.93-4.1	1(10)	56[e]
$2.28\cdot10^{-4}$-$1.37\cdot10^{-3}$	273-335	atmospheric	15	56[f]
$5.69\cdot10^{-4}$-$7.44\cdot10^{-4}$	293-294	atmospheric	13(14)	56[g]
$3.46\cdot10^{-3}$-$2.64\cdot10^{-2}$	273-373	10.8-94.5	57(60)	56[h]
$9.93\cdot10^{-5}$-$1.26\cdot10^{-4}$	291-295	0.15-0.20	1(6)	56[i]
$1.07\cdot10^{-2}$-$1.28\cdot10^{-1}$	473-603	98-490	31(79)[b,c]	56[j]
$8.10\cdot10^{-3}$-$2.14\cdot10^{-2}$	293-308	25.3-76.0	3(20)	56[k]
$1.16\cdot10^{-2}$-$5.82\cdot10^{-2}$	323-423	100-800	6(14)[c]	56[l]
$2.72\cdot10^{-3}$-$7.17\cdot10^{-3}$	306-486	8.0-58.0	7	56[m]

[a]Numbers in parenthesis indicate the total number of relevant experimental data in the paper, in case different from the number of point included in the parameter estimation

[b]Points discarded when above the maximum temperature considered of 90% of the solvent critical temperature

[c]Points discarded when above the maximum pressure considered of 400 bar

[d]Verdet (1855), [e]de Khanikof & Louguinine (1867), [f]Bohr (1899), [g]Buch (1926), [h]Zel'venskii (1937), [i]Koch et al. (1949), [j]Malinin (1959), [k]Vilcu and Gainar (1967), [l]Shagiakhmetov & Tarzimanov (1982), [m]Cramer(1982)

Table 2: Literature data for CO_2-C_2H_5OH system

Gas solubility [mol/mol total]	Temperature T[K]	Pressure P[bar]	Data points[a]	Reference
$3.28\cdot10^{-3}$-$3.43\cdot10^{-2}$	288-323	0.86-5.38	20(23)	15
$1.09\cdot10^{-1}$-$3.58\cdot10^{-1}$	293-373	29.4-127.5	7(24)	37
$5.40\cdot10^{-3}$-$7.13\cdot10^{-3}$	291-307	atmospheric	9	38
$2.66\cdot10^{-1}$-$9.50\cdot10^{-1}$	313-343	50.3-118.0	10(29)	57
$1.90\cdot10^{-1}$-$9.97\cdot10^{-1}$	304-323	33.1-79.6	23(30)	58
$1.87\cdot10^{-2}$-$9.29\cdot10^{-1}$	313-333	5.3-106.3	16(24)	59
$2.00\cdot10^{-2}$-$8.73\cdot10^{-1}$	313-333	5.1-106.5	12(23)	60
$2.73\cdot10^{-1}$-$9.96\cdot10^{-1}$	304-308	37.5-76.7	6(19)	61
$1.83\cdot10^{-1}$-$8.86\cdot10^{-1}$	305-323	22.2-91.7	27(33)	62
$1.14\cdot10^{-1}$-$8.76\cdot10^{-1}$	298	15.5-59.0	18	63
$5.29\cdot10^{-2}$-$8.30\cdot10^{-1}$	291-313	8.6-79.2	45(68)	64
$1.10\cdot10^{-1}$-$9.95\cdot10^{-1}$	308	15.5-77.9	10(20)	65
$3.30\cdot10^{-2}$-$9.70\cdot10^{-1}$	312	6-81.5	5(11)	66
$2.72\cdot10^{-1}$-$8.45\cdot10^{-1}$	315-337	55.5-108.4	16(23)	67
$5.29\cdot10^{-2}$-$8.49\cdot10^{-1}$	291-313	9.1-79.2	37(60)	68
$1.21\cdot10^{-1}$-$9.08\cdot10^{-1}$	303-329	17.8-91.0	39(52)	69
$2.90\cdot10^{-2}$-$8.50\cdot10^{-1}$	323-329	13.2-146.2	11(22)	70
$2.48\cdot10^{-1}$-$5.09\cdot10^{-1}$	323	50.3-82.0	12	71
$2.85\cdot10^{-2}$-$6.43\cdot10^{-1}$	323-333	7.3-94.6	13(22)	72
$2.37\cdot10^{-2}$-$9.46\cdot10^{-1}$	313-373	4.8-141.1	23(43)	73
$2.69\cdot10^{-2}$-$9.67\cdot10^{-1}$	313-345	5.7-119.3	20(55)	74
$7.26\cdot10^{-2}$-$8.13\cdot10^{-1}$	333-453	40.0-145.0	10(21)	75
$5.40\cdot10^{-2}$-$6.10\cdot10^{-1}$	348-368	20.0-140.0	1(7)	76
$7.78\cdot10^{-2}$-$8.44\cdot10^{-1}$	313-328	16.0-94.2	12(22)	77
$1.34\cdot10^{-1}$-$7.81\cdot10^{-1}$	333	30.5-104.1	4(7)	78
$1.84\cdot10^{-1}$-$9.96\cdot10^{-1}$	291	20.9-54.0	9	79
$5.50\cdot10^{-3}$-$3.28\cdot10^{-1}$	288-318	0.6-57.3	62(70)	80
$2.00\cdot10^{-1}$-$8.00\cdot10^{-1}$	333-483	70.0-142.4	26(59)[b]	81
$1.92\cdot10^{-1}$-$9.85\cdot10^{-1}$	291-313	24.5-81.8	45(64)	82
$5.78\cdot10^{-2}$-$7.55\cdot10^{-1}$	313-353	13.1-139.0	11(31)	83
$1.87\cdot10^{-2}$-$9.13\cdot10^{-1}$	293-353	5.2-110.8	36(46)	84
$4.80\cdot10^{-2}$-$7.26\cdot10^{-1}$	313	6.1-77.2	15(16)	85
$1.00\cdot10^{-1}$-$9.50\cdot10^{-1}$	313	19.7-81.8	6(10)	86
$2.70\cdot10^{-2}$-$2.12\cdot10^{-1}$	313	5.1-38.1	8	87
$5.98\cdot10^{-2}$-$7.70\cdot10^{-1}$	333-373	11.2-141.5	31(36)	88
$4.90\cdot10^{-2}$-$5.89\cdot10^{-1}$	303-323	10.2-60.8	11(12)	89
$5.55\cdot10^{-2}$-$2.19\cdot10^{-1}$	293-303	7.5-30.5	6	90
$5.30\cdot10^{-2}$-$2.06\cdot10^{-1}$	293-303	7.2-29.0	6	91
$5.86\cdot10^{-3}$-$7.45\cdot10^{-3}$	288-298	atmospheric	3	92
$5.97\cdot10^{-1}$-$9.56\cdot10^{-1}$	298-409	61.8-151.7	1(15)	93
$2.41\cdot10^{-1}$-$4.86\cdot10^{-1}$	291-323	33.0-81.1	11(12)	94
$5.50\cdot10^{-1}$-$9.50\cdot10^{-1}$	314-324	70.7-83.0	3(7)	95
$6.60\cdot10^{-1}$-$8.20\cdot10^{-1}$	238-308	8.6-71.4	15(17)	96
$3.37\cdot10^{-1}$-$8.75\cdot10^{-1}$	314	55.4-79.2	5(8)	97
$2.20\cdot10^{-1}$-$5.36\cdot10^{-1}$	373	70.0-133.0	1(3)	98
$2.07\cdot10^{-1}$-$8.07\cdot10^{-1}$	298-323	27.9-88.9	21(28)	99
$6.80\cdot10^{-3}$-$7.57\cdot10^{-3}$	290-296	atmospheric	6	100[c]
$4.35\cdot10^{-3}$-$1.05\cdot10^{-2}$	278-333	1.04-1.49	3(7)	100[d]

[a]Numbers in parenthesis indicate the total number of relevant experimental data in the paper, in case different from the number of point included in the parameter estimation

[b]Points discarded when above the maximum temperature considered of 90% of the solvent critical temperature

[c]Kosakewitsch (1929), [d]Cargill and MacPhee (1981)

Table 3: Literature data for CO_2-CH_3COOH system

Gas solubility [mol/mol total]	Temperature T[K]	Pressure P[bar]	Data points	Reference
$4.85\cdot10^{-1}$-$7.98\cdot10^{-1}$	323	56.2-83.7	5	9
$9.64\cdot10^{-2}$-$7.10\cdot10^{-1}$	313-353	11.0-111.0	20	13
$9.16\cdot10^{-3}$-$1.28\cdot10^{-2}$	291-309	atmospheric	10	38
$1.07\cdot10^{-2}$-$1.32\cdot10^{-2}$	288-298	atmospheric	3	92
$1.20\cdot10^{-2}$-$7.54\cdot10^{-1}$	298-348	2.7-74.1	50	101
$7.93\cdot10^{-2}$-$8.18\cdot10^{-1}$	293-333	6.4-74.3	19	102
$5.04\cdot10^{-1}$	283-364	29.0-103.3	9	103

Table 4: Literature data for CO-H_2O system

Gas solubility mol frac	Temperature T[K]	Pressure P[bar]	Data points[a]	Reference
$1.84 \cdot 10^{-5}$-$2.03 \cdot 10^{-5}$	293-298	atmospheric	2	92
$1.63 \cdot 10^{-5}$-$2.85 \cdot 10^{-5}$	273-303	atmospheric	19	104
$1.02 \cdot 10^{-5}$-$2.72 \cdot 10^{-5}$	273-353	0.63-1.61	47	105
$3.43 \cdot 10^{-4}$-$4.15 \cdot 10^{-4}$	343-403	32	7	106
$1.21 \cdot 10^{-4}$-$1.27 \cdot 10^{-3}$	298-573	11.3-94.29	84 (118)[b]	107
$2.97 \cdot 10^{-5}$-$3.34 \cdot 10^{-3}$	311-589	3.4-137.9	17(18)[b]	108
$2.91 \cdot 10^{-4}$-$1.17 \cdot 10^{-3}$	298-448	20.3-72.2	4(12)	109
$8.92 \cdot 10^{-6}$-$2.08 \cdot 10^{-5}$	278-323	0.59-1.09	14	110
$7.49 \cdot 10^{-6}$-$2.83 \cdot 10^{-5}$	273-353	atmospheric	8	111
$6.22 \cdot 10^{-6}$-$1.45 \cdot 10^{-5}$	310	0.48-1.01	15	112
$1.43 \cdot 10^{-5}$-$2.18 \cdot 10^{-5}$	285-310	atmospheric	3	112
$1.80 \cdot 10^{-5}$-$2.28 \cdot 10^{-5}$	279-295	atmospheric	6	113c

[a]Numbers in parenthesis indicate the total number of relevant experimental data in the paper, in case different from the number of point included in the parameter estimation

[b]Points discarded when above 250 °C. According to Jung and Knacke [107], above this temperature the water gas shift reaction (WGS) becomes kinetically active altering the system composition

[c]Bunsen (1855)

Table 5: Literature data for CO-C_2H_5OH system

Gas solubility [mol/mol total]	Temperature T[K]	Pressure P[bar]	Data points[a]	Reference
$4.61 \cdot 10^{-4}$	293-298	atmospheric	2	92
$9.72 \cdot 10^{-3}$-$4.59 \cdot 10^{-2}$	298-448	20.3-83.17	12	109
$5.00 \cdot 10^{-3}$-$2.21 \cdot 10^{-2}$	298-323	10.1-40.3	8	114
$4.85 \cdot 10^{-4}$-$4.94 \cdot 10^{-4}$	293-323	atmospheric	10	115
$5.88 \cdot 10^{-3}$-$1.72 \cdot 10^{-2}$	373-413	11.0-24.4	2(6)	116
$4.61 \cdot 10^{-4}$	298	atmospheric	1	117

[a]Numbers in parenthesis indicate the total number of relevant experimental data in the paper, in case different from the number of point included in the parameter estimation

Table 6: Literature data for CO-CH_3COOH system

Gas solubility [mol/mol total]	Temperature T[K]	Pressure P[bar]	Data points	Reference
$3.95 \cdot 10^{-4}$-$3.96 \cdot 10^{-4}$	293-298	atmospheric	2	92
$9.00 \cdot 10^{-4}$-$2.07 \cdot 10^{-2}$	298-348	2.2-55.6	42	101
$6.79 \cdot 10^{-3}$-$3.10 \cdot 10^{-2}$	298-448	20.3-70.3	12	109
$3.97 \cdot 10^{-4}$-$4.00 \cdot 10^{-4}$	298	atmospheric	2	117

Table 7: Literature data for CH_4-H_2O system

Gas solubility [mol/mol total]	Temperature T[K]	Pressure P[bar]	Data points[a]	Reference
$1.73\cdot10^{-4}$-$6.76\cdot10^{-3}$	323-589	1308-168.9	12(16)	2
$1.48\cdot10^{-3}$-$2.74\cdot10^{-3}$	298	73.6-178.2	4	28
$8.65\cdot10^{-6}$-$5.26\cdot10^{-5}$	285-348	atmospheric	7(11)	43
$1.34\cdot10^{-5}$-$2.59\cdot10^{-5}$	273-353	0.58-1.44	38	105
$5.10\cdot10^{-4}$-$1.62\cdot10^{-3}$	298-323	30-80	6	118
$2.54\cdot10^{-5}$-$4.03\cdot10^{-5}$	278-298	atmospheric	5	119
$6.04\cdot10^{-4}$-$2.61\cdot10^{-3}$	284-324	47.8-194.9	17(22)	120
$9.10\cdot10^{-6}$-$2.60\cdot10^{-4}$	303-323	1.12-6.38	1(18)	121
$5.63\cdot10^{-4}$-$4.05\cdot10^{-3}$	283-303	20-400	16(17)	122
$2.04\cdot10^{-4}$-$2.46\cdot10^{-3}$	275-313	9.7-180.0	16	123
$2.10\cdot10^{-4}$-$1.60\cdot10^{-3}$	299-314	9.9-99.8	8	124
$1.49\cdot10^{-5}$-$4.32\cdot10^{-5}$	275-328	0.82-1.18	16	125
$1.79\cdot10^{-5}$-$2.76\cdot10^{-5}$	293-323	1.04-1.14	13	126
$7.41\cdot10^{-4}$-$1.09\cdot10^{-1}$	427-627	35-1972	10(71)[b,c]	127
$8.87\cdot10^{-4}$-$4.11\cdot10^{-3}$	324-375	56-580	7(14)[c]	128
$6.00\cdot10^{-5}$-$1.13\cdot10^{-3}$	298-303	3.2-51.7	14(17)	129
$1.40\cdot10^{-3}$-$4.10\cdot10^{-3}$	324-376	109-499	4(7)[c]	130
$3.23\cdot10^{-4}$-$7.75\cdot10^{-3}$	298-444	22-689	55(71)[c]	131
$1.36\cdot10^{-3}$-$4.30\cdot10^{-3}$	325-398	101-616	18(28)[c]	132
$2.76\cdot10^{-4}$-$1.53\cdot10^{-3}$	283-298	11.3-51.8	21	133
$2.58\cdot10^{-4}$-$2.00\cdot10^{-3}$	274-286	5.7-90.8	16(18)	134
$4.05\cdot10^{-4}$-$2.21\cdot10^{-3}$	298-338	25.0-125.0	15	135
$1.47\cdot10^{-5}$-$4.61\cdot10^{-5}$	273-358	1.02-1.59	18	136
$1.44\cdot10^{-3}$-$3.41\cdot10^{-3}$	324	100-400	3(4)	137
$1.90\cdot10^{-5}$-$3.98\cdot10^{-5}$	278-318	atmospheric	9	138
$6.40\cdot10^{-5}$-$6.35\cdot10^{-4}$	311-394	3.5-38.4	45(46)	139
$2.13\cdot10^{-5}$-$3.98\cdot10^{-5}$	278-308	atmospheric	4	140
$1.08\cdot10^{-3}$-$2.11\cdot10^{-3}$	273-285	26.5-91.0	13	141
$2.12\cdot10^{-4}$-$1.03\cdot10^{-3}$	298-518	13.3-64.5	7	142
$9.00\cdot10^{-5}$-$4.26\cdot10^{-3}$	298	4-468	22(34)[c]	143
$5.00\cdot10^{-5}$-$1.54\cdot10^{-3}$	313-373	3.4-92.6	26	144
$9.58\cdot10^{-4}$-$2.44\cdot10^{-3}$	298	37.7-115.1	2(4)	145
$6.10\cdot10^{-4}$-$2.97\cdot10^{-3}$	298-423	41-469	13(39)[c]	146
$2.25\cdot10^{-5}$-$4.47\cdot10^{-5}$	274-303	atmospheric	35	147
$2.22\cdot10^{-4}$-$1.24\cdot10^{-3}$	303-373	9.7-71.3	91(167)	148
$1.75\cdot10^{-5}$-$3.93\cdot10^{-5}$	278-318	atmospheric	3	149
$1.78\cdot10^{-5}$-$4.35\cdot10^{-5}$	275-313	atmospheric	6	150
$2.33\cdot10^{-5}$-$3.47\cdot10^{-5}$	283-303	atmospheric	5	151
$1.97\cdot10^{-5}$-$2.80\cdot10^{-5}$	291-310	atmospheric	6	152[d]
$1.00\cdot10^{-3}$-$1.43\cdot10^{-1}$	423-633	98-1132	5 (56)[b,c]	152[e]

[a]Numbers in parenthesis indicate the total number of relevant experimental data in the paper, in case different from the number of point included in the parameter estimation
[b]Points discarded when above the maximum temperature considered of 90% of the solvent critical temperature
[c]Points discarded when above the maximum pressure considered of 400 bar
[d]Lannung and Gjaldbaek (1960), [e]Sultanov et al. (1972)

Table 8: Literature data for CH_4-C_2H_5OH system

Gas solubility [mol/mol total]	Temperature T[K]	Pressure P[bar]	Data points[a]	Reference
$2.10\cdot10^{-2}$-$1.07\cdot10^{-1}$	313-333	18.1-104.6	10	60
$9.50\cdot10^{-3}$-$1.05\cdot10^{-1}$	298	10.0-120.0	5	145
$1.20\cdot10^{-3}$-$1.33\cdot10^{-3}$	291-310	atmospheric	6	152[b]
$1.00\cdot10^{-3}$-$1.11\cdot10^{-3}$	293-313	atmospheric	3	153
$1.23\cdot10^{-3}$-$1.38\cdot10^{-3}$	283-303	atmospheric	5	154
$2.30\cdot10^{-2}$-$1.24\cdot10^{-1}$	280-333	21.0-121.0	19	155
$1.80\cdot10^{-2}$-$1.26\cdot10^{-1}$	280	15.7-113.7	10	156
$1.30\cdot10^{-2}$-$9.90\cdot10^{-2}$	295	10.2-79.9	7(8)	157
$2.36\cdot10^{-2}$-$2.70\cdot10^{-2}$	323-373	21.2-26.6	3(4)	158
$2.44\cdot10^{-2}$-$4.35\cdot10^{-1}$	298-498	33.2-315.3	14(27)	159
$1.22\cdot10^{-3}$	298	atmospheric	1	160
$1.28\cdot10^{-3}$	298	atmospheric	1	161

[a]Numbers in parenthesis indicate the total number of relevant experimental data in the paper, in case different from the number of point included in the parameter estimation
[b]Lannung and Gjaldbaek (1960)

Table 9: Literature data for CH_4-CH_3COOH system

Gas solubility [mol/mol total]	Temperature T[K]	Pressure P[bar]	Data points	Reference
$1.20\cdot10^{-3}$-$3.82\cdot10^{-2}$	298-348	2.6-70.2	43	101

Table 10: Literature data for N_2-H_2O system

Gas solubility [mol/mol total]	Temperature T[K]	Pressure P[bar]	Data points[a]	Reference
$5.38\cdot10^{-6}$-$1.36\cdot10^{-5}$	286-346	atmospheric	12	43
$1.15\cdot10^{-5}$-$1.83\cdot10^{-5}$	274-304	atmospheric	10	46
$2.30\cdot10^{-5}$-$2.94\cdot10^{-3}$	311-589	3.4-137.9	12(16)	108
$9.26\cdot10^{-6}$-$1.68\cdot10^{-5}$	278-313	atmospheric	8	138
$2.06\cdot10^{-4}$-$4.05\cdot10^{-4}$	298	20.3-40.6	2	145
$1.30\cdot10^{-4}$-$5.86\cdot10^{-4}$	313-363	9.0-60.8	54(94)	148
$1.07\cdot10^{-5}$-$1.55\cdot10^{-5}$	283-298	0.84	3(4)	162
$7.40\cdot10^{-5}$-$1.07\cdot10^{-3}$	274-363	9.1-71.6	52	163
$3.22\cdot10^{-6}$-$1.70\cdot10^{-3}$	273-433	1.0-200.0	48(85)	164
$9.64\cdot10^{-6}$-$1.77\cdot10^{-5}$	276-310	atmospheric	6	165
$7.84\cdot10^{-6}$-$1.86\cdot10^{-5}$	274-325	atmospheric	25	166
$1.15\cdot10^{-5}$	298	atmospheric	1	167
$1.11\cdot10^{-5}$-$1.83\cdot10^{-5}$	275-300	atmospheric	33	168
$1.23\cdot10^{-5}$	294	atmospheric	1	169
$2.10\cdot10^{-4}$-$5.71\cdot10^{-3}$	298-373	25-1013	20(24)[b]	170

[a]Numbers in parenthesis indicate the total number of relevant experimental data in the paper, in case different from the number of point included in the parameter estimation

[b]Points discarded when above the maximum pressure considered of 400 bar

Table B 11: Literature data for N_2-C_2H_5OH system

Gas solubility [mol/mol total]	Temperature T[K]	Pressure P[bar]	Data points[a]	Reference
$3.17\cdot10^{-4}$-$3.20\cdot10^{-4}$	293-298	atmospheric	2	92
$3.62\cdot10^{-4}$	298	atmospheric	1	116
$1.25\cdot10^{-2}$-$2.74\cdot10^{-2}$	323-373	35.0-70.0	6	158
$3.51\cdot10^{-4}$	298	atmospheric	1	160
$3.48\cdot10^{-4}$	298	atmospheric	1	161
$2.60\cdot10^{-4}$-$4.36\cdot10^{-2}$	298-398	0.8-98.7	36	171
$2.98\cdot10^{-4}$-$3.45\cdot10^{-4}$	293-313	atmospheric	2	172
$2.97\cdot10^{-4}$-$3.46\cdot10^{-4}$	273-313	atmospheric	3	173
$2.59\cdot10^{-4}$-$3.49\cdot10^{-4}$	248-323	atmospheric	4	174
$3.29\cdot10^{-4}$-$3.70\cdot10^{-4}$	213-298	atmospheric	4(5)	175

[a]Numbers in parenthesis indicate the total number of relevant experimental data in the paper, in case different from the number of point included in the parameter estimation

Table 12: Literature data for N_2-CH_3COOH system

Gas solubility [mol/mol total]	Temperature T[K]	Pressure P[bar]	Data points	Reference
$2.75\cdot10^{-4}$-$2.74\cdot10^{-4}$	293-298	atmospheric	2	92
$1.00\cdot10^{-3}$-$2.67\cdot10^{-2}$	323-473	10.1-60.8	25	176

Table 13: Literature data for H_2-H_2O system

Gas solubility [mol/mol total]	Temperature T[K]	Pressure P[bar]	Data points[a]	Reference
$1.29\cdot10^{-5}$-$1.55\cdot10^{-5}$	285-345	atmospheric	10(12)	43
$3.74\cdot10^{-5}$-$2.98\cdot10^{-3}$	311-589	3.4-137.9	17(18)[b]	108
$6.56\cdot10^{-4}$-$2.05\cdot10^{-3}$	298	50.3-152.3	5	145
$1.98\cdot10^{-4}$-$1.72\cdot10^{-3}$	293-408	10-3-99.8	75(114)	148
$2.00\cdot10^{-4}$-$2.71\cdot10^{-3}$	366-589	13.8-110.3	8(9)[b]	177
$1.31\cdot10^{-5}$-$1.38\cdot10^{-5}$	298-353	atmospheric	3(4)	178
$1.36\cdot10^{-5}$	298	atmospheric	1	179
$4.02\cdot10^{-4}$-$2.23\cdot10^{-3}$	323-423	31.8-153.7	10	180
$1.39\cdot10^{-5}$-$1.70\cdot10^{-5}$	275-299	atmospheric	5	181
$1.15\cdot10^{-5}$-$1.70\cdot10^{-5}$	274-323	atmospheric	6	182
$1.38\cdot10^{-5}$-$1.49\cdot10^{-5}$	288-298	atmospheric	2	183
$1.30\cdot10^{-5}$-$1.47\cdot10^{-5}$	292-305	atmospheric	3	184
$1.31\cdot10^{-5}$-$1.32\cdot10^{-5}$	303	atmospheric	4	185
$1.05\cdot10^{-5}$-$1.39\cdot10^{-5}$	298-333	atmospheric	3	186
$1.32\cdot10^{-5}$-$1.72\cdot10^{-5}$	275-302	atmospheric	42[b]	187
$1.33\cdot10^{-5}$-$1.77\cdot10^{-5}$	373-302	atmospheric	6	188
$3.50\cdot10^{-4}$-$1.21\cdot10^{-2}$	298	25-1013	5(8)[c]	189
$3.27\cdot10^{-4}$-$1.43\cdot10^{-2}$	273-373	25-1013	21(48)[c]	190
$2.65\cdot10^{-4}$-$1.61\cdot10^{-3}$	325-616	13.9-161.0	4(13)[b]	191
$4.28\cdot10^{-5}$-$1.64\cdot10^{-2}$	319-636	4.4-284.5	20(26)[b]	192
$2.46\cdot10^{-4}$-$2.02\cdot10^{-3}$	373-436	16.5-101.3	47(48)	193
$1.42\cdot10^{-5}$	293	atmospheric	1	194[d]

[a]Numbers in parenthesis indicate the total number of relevant experimental data in the paper, in case different from the number of point included in the parameter estimation
[b]Points discarded when above the maximum temperature considered of 90% of the solvent critical temperature
[c]Points discarded when above the maximum pressure considered of 400 bar
[d]Hufner

Table 14: Literature data for H_2-C_2H_5OH system

Gas solubility [mol/mol total]	Temperature T[K]	Pressure P[bar]	Data points[a]	Reference
$1.05\cdot10^{-2}$-$4.11\cdot10^{-1}$	298-508	41.0-333.0	19(35)[b]	159
$1.16\cdot10^{-4}$-$1.95\cdot10^{-4}$	213-293	atmospheric	2(5)	175
$1.63\cdot10^{-4}$-$1.82\cdot10^{-4}$	298-323	atmospheric	2	179
$3.10\cdot10^{-3}$-$6.70\cdot10^{-3}$	291	13.9-31.2	4	195
$1.28\cdot10^{-4}$-$1.91\cdot10^{-4}$	279-333	atmospheric	6	196
$1.67\cdot10^{-4}$-$1.92\cdot10^{-4}$	274-323	atmospheric	8	197

[a]Numbers in parenthesis indicate the total number of relevant experimental data in the paper, in case different from the number of point included in the parameter estimation
[b]Points discarded when above the maximum temperature considered of 90% of the solvent critical temperature

Table 15: Literature data for H_2-CH_3COOH system

Gas solubility [mol/mol total]	Temperature T[K]	Pressure P[bar]	Data points[a]	Reference
$1.20\cdot10^{-3}$-$2.15\cdot10^{-2}$	298-348	2.7-74.5	45(0)	101
$1.38\cdot10^{-4}$-$1.63\cdot10^{-4}$	292-348	atmospheric	11(0)	197
$1.45\cdot10^{-4}$-$1.46\cdot10^{-4}$	293-298	atmospheric	2(0)	92

[a]Numbers in parenthesis indicate the total number of relevant experimental data in the paper, in case different from the number of point included in the parameter estimation

REFERENCES

(1) Hou, S.-X.; Maitland, G. C.; Trusler, J. P. M. Measurement and Modeling of the Phase Behavior of the (Carbon Dioxide+water) Mixture at Temperatures from 298.15K to 448.15K. *J. Supercrit. Fluids* 2013, *73*, 87–96.

(2) Gillespie, P. C.; Wilson, G. M. *Vapor-Liquid and Liquid-Liquid Equilibria: Water-Methane, Water-Carbon Dioxide, Water-Hydrogen Sulfide, Water-Npentane, Water-Methane-Npentane*; Tulsa, Oklahoma, 1982.

(3) Fonseca, I. M. A.; Almeida, J. P. B.; Fachada, H. C. Automated Apparatus for Gas Solubility Measurements. *J. Chem. Thermodyn.* 2007, *39* (10), 1407–1411.

(4) Schüler, N.; Hecht, K.; Kraut, M.; Dittmeyer, R. On the Solubility of Carbon Dioxide in Binary Water-Methanol Mixtures. *J. Chem. Eng. Data* 2012, *57*, 2304–2308.

(5) Novak, J.; Fried, V.; Pick, J. Löslichkeit Des Kohlendioxids in Wasser Bei Verschiedenen Drücken Und Temperaturen. *Collect. Czechoslov. Chem. Commun.* 1961, *26*, 2266–2270.

(6) Tödheide, K.; Franck, E. U. Das Zweiphasengebiet Und Die Kritische Kurve Im System Kohlendioxid–Wasser Bis Zu Drucken von 3500 Bar. *Zeitschrift für Phys. Chemie* 1963, *37* (6), 387–401.

(7) Takenouchi, S.; Kennedy, G. C. The Binary System H2O-CO2 at High Temperatures and Pressures. *Am. J. Sci.* 1964, *262*, 1055–1074.

(8) Zawisza, A.; Malesińska, B. Solubility of Carbon Dioxide in Liquid Water and of Water in Gaseous Carbon Dioxide in the Range 0.2-5 MPa and at Temperatures up to 473 K. *J. Chem. Eng. Data* 1981, *26* (4), 388–391.

(9) Briones, J. A.; Mullins, J. C.; Thies, M. C.; Kim, B. U. Ternary Phase Equilibria for Acetic Acid-Water Mixtures with Supercritical Carbon Dioxide. *Fluid Phase Equilib.* 1987, *36*, 235–246.

(10) Müller, G.; Bender, E.; Maurer, G. Das Dampf-Flüssigkeitsgleichgewicht Des Ternären Systems Ammoniak-Kohlendioxid-Wasser Bei Hohen Wassergehalten Im Bereich Zwischen 373 Und 473 Kelvin. *Berichte der Bunsengesellschaft für Phys. Chemie* 1988, *92*, 148–160.

(11) Sako, T.; Sugeta, T.; Nakazawa, N.; Okubo, T.; Sato, M.; Taguchi, T.; Hiaki, T. Phase Equilibrium Study of Extraction and Concentration of Furfural Produced in Reactor Using Supercritical Carbon Dioxide. *J. Chem. Eng. Japan* 1991, *24* (4), 449–455.

(12) Gu Feiyan. Solubility of Carbon Dioxide in Aqueous Sodium Chloride under Pressure. *J. Chem. Eng. Chinese Univ.* 1998, *12* (2), 118–123.

(13) Bamberger, A.; Sieder, G.; Maurer, G. High-Pressure (Vapor+liquid) Equilibrium in Binary Mixtures of (Carbon Dioxide+water or Acetic Acid) at Temperatures from 313 to 353 K. *J. Supercrit. Fluids* 2000, *17*, 97–110.

(14) Valtz, A.; Chapoy, A.; Coquelet, C.; Paricaud, P.; Richon, D. Vapour-Liquid Equilibria in the Carbon Dioxide-Water System, Measurement and Modelling from 278.2 to 318.2 K. *Fluid Phase Equilib.* 2004, *226*, 333–344.

(15) Dalmolin, I.; Skovroinski, E.; Biasi, A.; Corazza, M. L.; Dariva, C.; Oliveira, J. V. Solubility of Carbon Dioxide in Binary and Ternary Mixtures with Ethanol and Water. *Fluid Phase Equilib.* 2006, *245*, 193–200.

(16) Koschel, D.; Coxam, J. Y.; Rodier, L.; Majer, V. Enthalpy and Solubility Data of CO2 in Water and NaCl(aq) at Conditions of Interest for Geological Sequestration. *Fluid Phase Equilib.* 2006, *247*, 107–120.

(17) Campos, C. E. P. S.; Villardi, H. G. D.; Pessoa, F. L. P.; Uller, A. M. C. Solubility of Carbon Dioxide in Water and Hexadecane: Experimental Measurement Andt Thermodynamic Modeling. *J. Chem. Eng. Data* 2009, *54* (10), 2881–2886.

(18) Han, X.; Yu, Z.; Qu, J.; Qi, T.; Guo, W.; Zhang, G. Measurement and Correlation of Solubility Data for CO2 in NaHCO3 Aqueous Solution. *J. Chem. Eng. Data* 2011, *56*, 1213–1219.

(19) Lucile, F.; Cézac, P.; Contamine, F.; Serin, J.; Houssin, D.; Arpentinier, P. Solubility of Carbond Dioxide in Water and Aqueous Solution Containing Sodium Hydroxide at Temperatures from (293.15 to 393.15) K and Pressure up to 5 MPa: Experimental Measurements. *J. Chem. Eng. Data* 2012, *57*, 784–789.

(20) Serpa, F. S.; Vidal, R. S.; Filho, J. H. B. A.; Nascimento, J. F. do; Ciambelli, J. R. P.; Figueiredo, C. M. S.; Salazar-Banda, G. R.; Santos, A. F.; Fortuny, M.; Franceschi, E.; et al. Solubility of Carbon Dioxide in Ethane-1,2-Diol-Water Mixtures. *J. Chem. Eng. Data* 2013, *58*, 3464–3469.

(21) Stewart, P. B.; Munjal, P. Solubility of Carbon Dioxide in Pure Water, Synthetic Sea Water, and Synthetic Sea Water Concentrates at -5° to 25° C. and 10- to 45-Atm. Pressure. *J. Chem. Eng. Data* 1970, *15* (1), 67–71.

(22) D'Souza, R.; Patrick, J. R.; Teja, A. S. High Pressure Phase Equilibria in the Carbon Dioxide - N-Hexadecane and Carbon Dioxide - Water Systems. *Can. J. Chem. Eng.* 1988, *66*, 319–323.

(23) Nighswander, J. A.; Kalogerakis, N.; Mehrotra, K. Solubilities of Carbon Dioxide in Water and 1 Wt % NaCl Solution at Pressures up to 10 MPa and Temperatures from 80 to 200 °C. *J. Chem. Eng. Data* 1989, *34*, 355–360.

(24) Traub, P.; Stephan, K. High-Pressure Phase Equilibria of the System CO2-Water-Acetone Measured with a New Apparatus. *Chem. Eng. Sci.* 1990, *45* (3), 751–758.

(25) R.Dohrn; A.P.Bünz; F.Devlieghere; D.Thelen. Experimental Measurements of Phase Equilibria for Ternary and Quaternary Systems of Glucose, Water, CO2 and Ethanol with a Novel Apparatus. *Fluid Phase Equilib.* 1993, *83*, 149–158.

(26) Zheng, D.-Q.; Guo, T.-M.; Knapp, H. Experimental and Modeling Studies on the Solubility of CO2, CHClF2, CHF3, C2H2F4 and C2H4F2 in Water and Aqueous NaCl Solutions under Low Pressures. *Fluid Phase Equilib.* 1997, *129*, 197–209.

(27) Servio, P.; Englezos, P. Effect of Temperature and Pressure on the Solubility of Carbon Dioxide in Water in the Presence of Gas Hydrate. *Fluid Phase Equilib.* 2001, *190*, 127–134.

(28) Addicks, J.; Owren, G. A.; Fredheim, A. O.; Tangvik, K. Solubility of Carbon Dioxide and Methane in Aqueous Methyldiethanolamine Solutions. *J. Chem. Eng. Data* 2002, *47*, 855–860.

(29) Bermejo, M. D.; Martín, A.; Florusse, L. J.; Peters, C. J.; Cocero, M. J. The Influence of Na2SO4 on the CO2 Solubility in Water at High Pressure. *Fluid Phase Equilib.* 2005, *238*, 220–228.

(30) Guangxu, Z.; Yuanxin, W.; Peisheng, M.; Guangwen, W.; Dinghuo, L. Measurement and Correlation of Solubility of Carbon Monoxide and Other Gases Solubility in Phenol. *J. Chem. Ind. Eng.* 2005, *56* (11), 2039–2045.

(31) Hua, L. Solubility of Dilute CO2 in Dimethyl Sulfoxide and Its Henry's Constant. *J. Chem. Eng. Chinese Univ.* 2006, *20* (6), 860–863.

(32) Qin, J.; Rosenbauer, R. J.; Duan, Z. Experimental Measurements of Vapor–liquid Equilibria of the H2O + CO2 + CH4 Ternary System. *J. Chem. Eng. Data* 2008, *53*, 1246–1249.

(33) Martín, Á.; Pham, H. M.; Kilzer, A.; Kareth, S.; Weidner, E. Phase Equilibria of Carbon Dioxide + Poly Ethylene Glycol + Water Mixtures at High Pressure: Measurements and Modelling. *Fluid Phase Equilib.* 2009, *286*, 162–169.

(34) Dell'Era, C.; Uusi-Kyyny, P.; Pokki, J. P.; Pakkanen, M.; Alopaeus, V. Solubility of Carbon Dioxide in Aqueous Solutions of Diisopropanolamine and Methyldiethanolamine. *Fluid Phase Equilib.* 2010, *293*, 101–109.

(35) Tong, D.; Trusler, J. P. M.; Vega-Maza, D. Solubility of CO2 in Aqueous Solutions of CaCl2 or MgCl2 and in a Synthetic Formation Brine at Temperatures up to 423 K and Pressures up to 40 MPa. *J. Chem. Eng. Data* 2013, *58*, 2116–2124.

(36) Rumpf, B.; Nicolaisen, H.; Öcal, C.; Maurer, G. Solubility of Carbon Dioxide in Aqueous Solutions of Sodium Chloride: Experimental Results and Correlation. *J. Solution Chem.* 1994, *23* (3), 431–448.

(37) Sander, W. Über Die Löslichkeit Der Kohlensäure in Wasser Und Einigen Andern Lösungsmitteln Unter Höhern Drucken. *Zeitschrift für Phys. Chemie* 1911, *78* (1), 513–549.

(38) Kunerth, W. Solubility of CO2 and N2O in Certain Solvents. *Phys. Rev.* 1916, *19* (5), 512–524.

(39) Kritschewsky, I. R.; Shaworonkoff, N. M.; Aepelbaum, V. A. Gemeinsame Löslichkeit Der Gase in Flüssigkeiten Unter Druck. *Zeitschrift für Phys. Chemie* 1935, *175* (1), 232–238.

(40) Wiebe, R.; Gaddy, V. L. The Solubility in Water of Carbon Dioxide at 50, 75 and 100°, at Pressures to 700 Atmospheres. *J. Am. Chem. Soc.* 1939, *61* (2), 315–318.

(41) Wiebe, R.; Gaddy, V. L. The Solubility of Carbon Dioxide in Water at Various Temperatures from 12 to 40° and at Pressures to 500 Atmospheres. Critical Phenomena. *J. Am. Chem. Soc.* 1940, *62* (4), 815–817.

(42) Harned, H. S.; Davis, R. J. The Ionization Constant of Carbonic Acid in Water and the Solubility of Carbon Dioxide in Water and Aqueous Salt Solutions from 0 to 50°. *J. Am. Chem. Soc.* 1943, *65* (10), 2030–2037.

(43) Morrison, T. J.; Billett, F. The Salting-out of Non-Electrolytes. Part II. The Effect of Variation in Non-Electrolyte. *J. Chem. Soc.* 1952, 3819–3822.

(44) Ellis, A. J.; Golding, R. M. The Solubility of Carbon Dioxide above 100° C in Water and in Sodium Chloride Solutions. *Am. J. Sci.* 1963, *261* (1), 47–60.

(45) Matouš, J.; Šobr, J.; Novák, J. P.; Pick, J. Solubility of Carbon Dioxide in Water at Pressures up to 40 Atm. *Collect. Czechoslov. Chem. Commun.* 1969, *34* (12), 3982–3985.

(46) Murray, C. N.; Riley, J. P. The Solubility of Gases in Distilled Water and Sea Water-IV. Carbon Dioxide. *Deep. Res. Oceanogr. Abstr.* 1971, *18*, 533–541.

(47) Kiepe, J.; Horstmann, S.; Fischer, K.; Gmehling, J. Experimental Determination and Prediction of Gas Solubility Data for CO2 + H2O Mixtures Containing NaCl or KCl at Temperatures between 313 and 393 K and Pressures up to 10 MPa. *Ind. Eng. Chem. Res.* 2002, *41* (17), 4393–4398.

(48) Bartholomé, E.; Friz, H. Löslichkeit von Kohlendioxyd in Wasser Bei Höheren Drucken. *Chemie Ing. Tech.* 1956, *28* (11), 706–708.

(49) Sabirzyanov, A. N.; Shagiakhmetov, R. A.; Gabitov, F. R.; Tarzimanov, A. A.; Gumerov, F. M. Water Solubility of Carbon Dioxide under Supercritical and Subcritical Conditions. *Theor. Found. Chem. Eng.* 2003, *37* (1), 51–53.

(50) Prutton, C. F.; Savage, R. L. The Solubility of Carbon Dioxide in Calcium Chloride-Water Solutions at 75, 100, 120° and High Pressures. *J. Am. Chem. Soc.* 1945, *67* (9), 1550–1554.

(51) Wiebe, R. The Binary System Carbon Dioxide-Water under Pressure. *Chem. Rev.* 1941, *29* (3), 475–481.

(52) Findlay, A.; Creighton, H. J. M. The Influence of Colloids and Fine Suspensions on the Solubility of Gases in Water. Part I. Solubility of Carbon Dioxide and Nitrous Oxide. *J. Chem. Soc. Trans.* 1910, *97*, 536–561.

(53) Findlay, A.; Shen, B. The Influence of Colloids and Fine Suspensions on the Solubility of Gases in Water. Part II. Solubility of Carbon Dioxide and of Hydrogen. *J. Chem. Soc. Trans.* 1910, *101*, 1459–1468.

(54) Findlay, A.; Williams, T. The Influence of Colloids and Fine Suspensions on the Solubility of Gases in Water. Part III. Solubility of Carbon Dioxide at Pressures Lower than Atmospheric. *J. Chem. Soc. Trans.* 1913, *103*, 636–645.

(55) Findlay, A.; Howell, O. R. The Solubility of Carbon Dioxide in Water in the Presence of Starch. *J. Chem. Soc. Trans.* 1915, *107*, 282–284.

(56) Scharlin, P. *Solubility Data Series Volume 62 Carbon Dioxide in Water and Aqueous Electrolyte Solutions*, first.; International Union of Pure and Applied Chemistry, Oxford University Press: Oxford, UK, 1996; Vol. 62.

(57) Lim, J. S.; Lee, Y. Y.; Chun, H. S. Phase Equilibria for Carbon Dioxide-Ethanol-Water System at Elevated Pressures. *J. Supercrit. Fluids* 1994, *7* (4), 219–230.

(58) Feng, Y. S.; Du, X. Y.; Li, C. F.; Hou, Y. J. An Apparatus for Determining High Pressure Fluid Phase Equilibria and Its Applications to Supercritical Carbon Dioxide Mixtures. In *International Symposium on Supercritical Fluids*; Société Chimique de France: Nice, 1988; pp 75–84.

(59) Nagahama, K.; Suzuki, J.; Suzuki, T. High Pressure Vapor-Liquid Equilibria for the Supercritical CO2 + Ethanol + Water System. In *International Symposium on Supercritical Fluids*; Société Chimique de France: Nice, 1988; pp 143–150.

(60) Suzuki, K.; Sue, H.; Itou, M.; Smith, R. L.; Inomata, H.; Arai, K.; Saito, S. Isothermal Vapor-Liquid Equilibrium Data for Binary Systems at High Pressures: Carbon Dioxide-Methanol, Carbon Dioxide-Ethanol, Carbon Dioxide-1-Propanol, Methane-Ethanol, Methane-1-Propanol, Ethane-Ethanol, and Ethane-1-Propanol Systems. *J. Chem. Eng. Data* 1990, *35* (1), 63–66.

(61) Takishima, S.; Saiki, K.; Arai, K.; Saito, S. Phase Equilibria for CO2-C2H5OH-H2O System. *J. Chem. Eng. Japan* 1986, *19* (1), 48–56.

(62) Shanjing, Y.; Fenghua, L.; Zhaoxiong, H.; Ziqiang, Z. Vapor-Liquid Equilibria of Binary Systems of Alcohols, Water-Carbon Dioxide at Supercritical or near Critical Condition. *J. Chem. Eng. Chinese Univ.* 1989, *3* (3), 9–15.

(63) Kordikowski, A.; Schenk, A. P.; Van Nielen, R. M.; Peters, C. J. Volume Expansions and Vapor-Liquid Equilibria of Binary Mixtures of a Variety of Polar Solvents and Certain near-Critical Solvents. *J. Supercrit. Fluids* 1995, *8* (3), 205–216.

(64) Day, C.-Y.; Chang, C. J.; Chen, C.-Y. Phase Equilibrium of Ethanol + CO2 and Acetone + CO2 at Elevated Pressures. *J. Chem. Eng. Data* 1996, *41* (4), 839–843.

(65) Tanaka, H.; Kato, M. Vapor-Liquid Equilibirum Properties of Carbon Dioxide + Ethanol Mixtures at High Pressures. *J. Chem. Eng. Japan* 1995, *28* (3), 263–267.

(66) Yoon, J. H.; Lee, H. S.; Lee, H. High-Pressure Vapor-Liquid Equilibria for Carbon Dioxide + Methanol, Carbon Dioxide + Ethanol, and Carbon Dioxide + Methanol + Ethanol. *J. Chem. Eng. Data* 1993, *38* (1), 53–55.

(67) Jennings, D. W.; Lee, R. J.; Teja, A. S. Vapor-Liquid Equilibria in the Carbon Dioxide + Ethanol and Carbon Dioxide + 1-Butanol Systems. *J. Chem. Eng. Data* 1991, *36* (3), 303–307.

(68) Chang, C. J.; Day, C.-Y.; Ko, C.-M.; Chiu, K.-L. Densities and P-X-Y Diagrams for Carbon Dioxide Dissolution in Methanol, Ethanol, and Acetone Mixtures. *Fluid Phase Equilib.* 1997, *131*, 243–258.

(69) Naiwen, Z.; Xiyin, Z. Vapor-Liquid Equilibria for Carbon Dioxide-Ethanol and Carbon Dioxde-Iso-Propanol System. *Chem. Eng.* 1997, *25* (5), 54–59.

(70) de la Cruz, M. J. L.; Galicia-Luna, L. A. High-Pressure Vapor-Liquid Equilibria for the Carbon Dioxide + Ethanol and Carbon Dioxide + Propan-1-Ol Systems at Temperatures from 322.36 K to 391.96 K. *ELDATA IThe Int. Eectronic J. Physico-Chemical Data* 1999, *5* (January 1999), 157–164.

(71) Chen, H.-I.; Chang, H.-Y.; Huang, E. T. S.; Huang, T.-C. A New Phase Behavior Apparatus for Supercritical Fluid Extraction Study. *Ind. Eng. Chem. Res.* 2000, *39*, 4849–4852.

(72) Elbaccouch, M. M.; Raymond, M. B.; Elliott, J. R. High-Pressure Vapor-Liquid Equilibrium for R-22 + Ethanol and R-22 + Ethanol + Water. *J. Chem. Eng. Data* 2000, *45* (2), 280–287.

(73) Galicia-Luna, L. A.; Ortega-Rodriguez, A.; Richon, D. New Apparatus for the Fast Determination of High-Pressure Vapor-Liquid Equilibria of Mixtures and of Accurate Critical Pressures. *J. Chem. Eng. Data* 2000, *45* (2), 265–271.

(74) Joung, S. N.; Yoo, C. W.; Shin, H. Y.; Kim, S. Y.; Yoo, K. P.; Lee, C. S.; Huh, W. S. Measurements and Correlation of High-Pressure VLE of Binary CO2-Alcohol Systems (Methanol, Ethanol, 2-Methoxyethanol and 2-Ethoxyethanol). *Fluid Phase Equilib.* 2001, *185*, 219–230.

(75) Tian, Y.-L.; Han, M.; Chen, L.; Feng, J.-J.; Qin, Y. Study on Vapor-Liquid Phase Equilibria for CO2-C2H5OH System. *Acta Physico-Chimica Sin.* 2001, *17* (2), 155–160160.

(76) Hugang, Z.; Tian, Y.-L.; Qin, Y.; Feng, J.-J. High-Pressure Phase Equilibria for Binary Ethanol System Containing Supercritical CO2. *Chinese J. Chem. Eng.* 2001, *9* (3), 322–325.

(77) Tsivintzelis, I.; Missopolinou, D.; Kalogiannis, K.; Panayiotou, C. Phase Compositions and Saturated Densities for the Binary Systems of Carbon Dioxide with Ethanol and Dichloromethane. *Fluid Phase Equilib.* 2004, *224*, 89–96.

(78) Elizalde-Solis, O.; Galicia-Luna, L. A. Solubility of Thiophene in Carbon Dioxide and Carbon Dioxide + 1-Propanol Mixtures at Temperatures from 313 to 363 K. *Fluid Phase Equilib.* 2005, *230*, 51–57.

(79) Kodama, D.; Kato, M. High-Pressure Phase Equilibrium for Carbon Dioxide + Ethanol at 291.15 K. *J. Chem. Eng. Data* 2005, *50*, 16–17.

(80) Gui, X.; Tang, Z.; Fei, W. Solubility of CO2 in Alcohols, Glycols, Ethers, and Ketones at High Pressures from (288.15 to 318.15) K. *J. Chem. Eng. Data* 2011, *56*, 2420–2429.

(81) Wu, W.; Ke, J.; Poliakoff, M. Phase Boundaries of CO2 + Toluene, CO2 + Acetone, and CO2 + Ethanol at High Temperatures and High Pressures. *J. Chem. Eng. Data* 2006, *51*, 1398–1403.

(82) Chiu, H.-Y.; Lee, M.-J.; Lin, H. Vapor−liquid Phase Boundaries of Binary Mixtures of Carbon Dioxide with Ethanol and Acetone. *J. Chem. Eng. Data* 2008, *53*, 2393–2402.

(83) Knez, Ž.; Škerget, M.; Ilič, L.; Lütge, C. Vapor-Liquid Equilibrium of Binary CO2-Organic Solvent Systems (Ethanol, Tetrahydrofuran, Ortho-Xylene, Meta-Xylene, Para-Xylene). *J. Supercrit. Fluids* 2008, *43*, 383–389.

(84) Secuianu, C.; Feroiu, V.; Geană, D. Phase Behavior for Carbon Dioxide + Ethanol System: Experimental Measurements and Modeling with a Cubic Equation of State. *J. Supercrit. Fluids* 2008, *47*, 109–116.

(85) Tochigi, K.; Namae, T.; Suga, T.; Matsuda, H.; Kurihara, K.; Dos Ramos, M. C.; McCabe, C. Measurement and Prediction of High-Pressure Vapor-Liquid Equilibria for Binary Mixtures of Carbon Dioxide + N-Octane, Methanol, Ethanol, and Perfluorohexane. *J. Supercrit. Fluids* 2010, *55* (2), 682–689.

(86) Kato, M.; Kodama, D.; Ono, T.; Kokubo, M. Volumetric Properties of Carbon Dioxide + Ethanol at 313.15 K. *J. Chem. Eng. Data* 2009, *54*, 2953–2956.

(87) Dong, L.; Zheng, D.; Sun, G.; Wu, X. Vapor-Liquid Equilibrium Measurements of Difluoromethane + [Emim]OTf, Difluoromethane + [Bmim]OTf, Difluoroethane + [Emim]OTf, and Difluoroethane + [Bmim]OTf Systems. *J. Chem. Eng. Data* 2011, *56*, 3663–3668.

(88) Sima, S.; Feroiu, V.; Geană, D. New High Pressure Vapor-Liquid Equilibrium and Density Predictions for the Carbon Dioxide + Ethanol System. *J. Chem. Eng. Data* 2011, *56*, 5052–5059.

(89) Kariznovi, M.; Nourozieh, H.; Abedi, J. Experimental Measurements and Predictions of Density, Viscosity, and Carbon Dioxide Solubility in Methanol, Ethanol, and 1-Propanol. *J. Chem. Thermodyn.* 2013, *57*, 408–415.

(90) Guo, L.; Wu, X.; Zheng, D.; Deng, W. Measurement and Correlation of Vapor-Liquid Equilibrium for the Carbon Dioxide + 1-Butoxy Butane System. *J. Chem. Eng. Data* 2010, *55*, 476–478.

(91) Meng, X.; Zheng, D.; Li, X.; Shen, Y. Isothermal Vapor–liquid Equilibrium Measurements of 1,1-Difluoroethane + N,N-Dimethylformamide and N,N-Dimethylacetamide. *J. Chem. Eng. Data* 2013, *58*, 1078–1085.

(92) Just, G. Löslichkeit von Gasen in Organischen Lösungsmitteln. *Zeitschrift für Phys. Chemie* 1901, *37*, 342–367.

(93) Yeo, S. Do; Park, S. J.; Kim, J. W.; Kim, J. C. Critical Properties of Carbon Dioxide+methanol, +ethanol, +1-Propanol, and +1-Butanol. *J. Chem. Eng. Data* 2000, *45*, 932–935.

(94) Stievano, M.; Elvassore, N. High-Pressure Density and Vapor-Liquid Equilibrium for the Binary Systems Carbon Dioxide-Ethanol, Carbon Dioxide-Acetone and Carbon Dioxide-Dichloromethane. *J. Supercrit. Fluids* 2005, *33*, 7–14.

(95) Vega Gonzalez, A.; Tufeu, R.; Subra, P. High-Pressure Vapor-Liquid Equilibrium for the Binary Systems Carbon Dioxide + Dimethyl Sulfoxide and Carbon Dioxide + Dichloromethane. *J. Chem. Eng. Data* 2002, *47*, 492–495.

(96) Hirohama, S.; Miyamoto, S.; Takatsuka, T.; Muto, T. Measurement and Correlation of Phase Equilibria for the Carbon Dioxide-Ethanol-Water System. *J. Chem. Eng. Japan* 1993, *26*, 408–415.

(97) Bae, W.; Kwon, S.; Byun, H. S.; Kim, H. Phase Behavior of the Poly(vinyl Pyrrolidone) + N-Vinyl-2-Pyrrolidone + Carbon Dioxide System. *J. Supercrit. Fluids* 2004, *30*, 127–137.

(98) Pfohl, O.; Pagel, A.; Brunner, G. Phase Equilibria in Systems Containing O-Cresol, P-Cresol, Carbon Dioxide, and Ethanol at 323.15-473.15 K and 10-35 MPa. *Fluid Phase Equilib.* 1999, *157*, 53–79.

(99) Mehl, A.; Nascimento, F. P.; Falcão, P. W.; Pessoa, F. L. P.; Cardozo-Filho, L. Vapor-Liquid Equilibrium of Carbon Dioxide + Ethanol: Experimental Measurements with Acoustic Method and Thermodynamic Modeling. *J. Thermodyn.* 2011, *2011*, 1–11.

(100) Fogg, P. G. T. *Solubility Data Series Volume 50 Carbon Dioxide in Non-Aqueous Solvents at Pressures Less Than 200 KPA*, first.; International Union of Pure and Applied Chemistry, Oxford University Press: Oxford, UK, 1992; Vol. 50.

(101) Jónasson, A.; Persson, O.; Rasmussen, P.; Soave, S. G. Vapor-Liquid Equilibria of Systems Containing Acetic Acid and Gaseous Components. Measurements and Calculations by a Cubic Equation of State. *Fluid Phase Equilib.* 1998, *152*, 67–94.

(102) Laugier, S.; Richon, D.; Renon, H. Simultaneous Determination of Vapor-Liquid Equilibria and Volumetric Properties of Ternary Systems with a New Experimental Apparatus. *Fluid Phase Equilib.* 1990, *54*, 19–34.

(103) Calvo, L.; de Loos, T. W. High Pressure Vapour-Liquid Equilibria of the Binary and Some of the Ternary and Multicomponent Mixtures of the Carbon Dioxide + Acetic Anhydride + α-Methylbenzyl Alcohol + Acetic Acid + α-Methylbenzyl Acetate System. Experimental and Modelling Results. *Fluid Phase Equilib.* 2006, *244*, 179–187.

(104) Wiesenburg, D. A.; Guinasso, N. L. J. Equilibrium Solubilities of Methane, Carbon Monoxide, and Hydrogen in Water and Sea Water. *J. Chem. Eng. Data* 1979, *24*, 356–360.

(105) Winkler, L. W. Die Löslichkeit Der Gase in Wasser. *Berichte der Dtsch. Chem. Gesellschaft* 1901, *34*, 1408–1422.

(106) Khan, M. M. T.; Halligudi, S. B. Solubility of Carbon Monoxide in Aqueous Mixtures of Allyl Alcohol, Diethylamine, and Triethylamine. *J. Chem. Eng. Data* 1988, *33*, 276–278.

(107) Jung, J.; Knacke, O.; Neuschütz, D. Löslichkeit von Kohlenmonoxid Und Wasserstoff in Wasser Bis 300°C. *Chemie Ing. Tech.* 1971, *43*, 112–116.

(108) Gillespie, P. C.; Wilson, G. M. *Vapor-Liquid Equilibrium Data on Water-Substitute Gas Components: N2-H2O, H2-H2O, CO-H2O, H2-CO-H2O, and H2S-H2O Gas*; Tulsa, Oklahoma, 1980.

(109) Dake, S. B.; Chaudharl, R. V. Solubility of CO in Aqueous Mixtures of Methanol, Acetic Acid, Ethanol, and Propionic Acid. *J. Chem. Eng. Data* 1985, *30*, 400–403.

(110) Rettich, T. R.; Battino, R.; Wilhelm, E. Solubility of Gases in Liquids: High-Precision Determination of Henry Coefficients for Carbon Monoxide in Liquid Water at 278 K to 323 K. *Berichte der Bunsengesellschaft für Phys. Chemie* 1982, *86*, 1128–1132.

(111) Glazunov, V. I. .; Fatkhutdinov, Z. A.; Magid, A. B. Conversion of Acid Products of Industrial Emissions. *Chem. Technol. Fuels Oils* 2001, *37*, 377–382.

(112) Power, G. G. Solubility of O2 and CO in Blood and Pulmonary and Placental Tissue. *J. Appl. Physiol.* 1968, *24*, 468–474.

(113) Robert W. Cargill. *Solubility Data Series Volume 43 Carbon Monoxide*, first.; International Union of Pure and Applied Chemistry, Oxford University Press: Oxford, UK, 1990; Vol. 43.

(114) Tonner, S. P.; Wainwright, M. S.; Trimm, D. L.; Cant, N. W. Solubility of Carbon Monoxide in Alcohols. *J. Chem. Eng. Data* 1983, *28*, 59–61.

(115) Gjaldbäk, J. C. The Solubility of Carbon Monoxide in Some Lower Monovalent Alcohols. *Mat. meddelelser* 1948, *24*, 1–17.

(116) Makranczy, J.; Rusz, L.; Balog-Megyery, K. Solubility of Gases in Normal Alcohols. *Hungarian J. Ind. Chem.* 1979, *7*, 41–46.

(117) Skirrow, F. W. Über Die Löslichkeit von Kohlenoxyd in Binären Organischen Gemischen. *Zeitschrift für Phys. Chemie* 1902, *41*, 139–160.

(118) Yokoyama, C.; Wakana, S.; Kaminishi, G. ichi; Takahashi, S. Vapor-Liquid Equilibria in the Methane-Diethylene Glycol-Water System at 298.15 and 323.15 K. *J. Chem. Eng. Data* 1988, *33*, 274–276.

(119) Muccitelli, J. A.; Wen, W. Y. Solubility of Methane in Aqueous Solutions of Triethylenediamine. *J. Solution Chem.* 1980, *9*, 141–161.

(120) Frost, M.; Karakatsani, E.; Von Solms, N.; Richon, D.; Kontogeorgis, G. M. Vapor-Liquid Equilibrium of Methane with Water and Methanol. Measurements and Modeling. *J. Chem. Eng. Data* 2014, *59*, 961–967.

(121) Pereira, C. E.; Campos, S.; Villardi, H. G. D. A.; Pessoa, F. L. P.; Uller, A. M. C. Experimental Measurement and Thermodynamic Modeling for the Solubility of Methane in Water and Hexadecane. *J. Chem. Eng. Data* 2010, *55*, 2576–2580.

(122) Wang, L. K.; Chen, G. J.; Han, G. H.; Guo, X. Q.; Guo, T. M. Experimental Study on the Solubility of Natural Gas Components in Water with or without Hydrate Inhibitor. *Fluid Phase Equilib.* 2003, *207*, 143–154.

(123) Chapoy, A.; Mohammadi, A. H.; Richon, D.; Tohidi, B. Gas Solubility Measurement and Modeling for Methane-Water and Methane-Ethane-N-Butane-Water Systems at Low Temperature Conditions. *Fluid Phase Equilib.* 2004, *220*, 113–121.

(124) Awan, J. A.; Thomsen, K.; Coquelet, C.; Fosbol, P. L.; Richon, D. Vapor-Liquid Equilibrium Measurements and Modeling of the Propyl Mercaptan plus Methane plus Water System. *J. Chem. Eng. Data* 2010, *55*, 842–846.

(125) Rettich, T. R.; Handa, Y. P.; Battino, R.; Wilhelm, E. Solubility of Gases in Liquids. 13. High-Precision Determination of Henry's Constants for Methane and Ethane in Liquid Water at 275 to 328 K. *J. Phys. Chem.* 1981, *85*, 3230–3237.

(126) Serra, M. C. C.; Pessoa, F. L. P.; Palavra, A. M. F. Solubility of Methane in Water and in a Medium for the Cultivation of Methanotrophs Bacteria. *J. Chem. Thermodyn.* 2006, *38*, 1629–1633.

(127) Price, L. C. Aqueous Solubility of Methane at Elevated Pressures and Temperatures: Geologic Notes. *Am. Assoc. Pet. Geol. Bull.* 1979, *63*, 1527–1533.

(128) Gao, J.; Zheng, D.-Q.; Guo, T.-M. Solubilities of Methane, Nitrogen, Carbon Dioxide, and a Natural Gas Mixture in Aqueous Sodium Bicarbonate Solutions under High Pressure and Elevated Temperature. *J. Chem. Eng. Data* 1997, *42*, 69–73.

(129) Duffy, J. R.; Smith, N. O.; Nagy, B. Solubility of Natural Gases in Aqueous Salt Solutions-I. Liquidus Surfaces in the System CH4-H2O-NaCl-CaCl2 at Room Temperatures and at Pressures below 1000 Psia. *Geochim. Cosmochim. Acta* 1961, *24*, 23–31.

(130) Qin, J.; Rosenbauer, R. J.; Duan, Z. Experimental Measurements of Vapor-Liquid Equilibria of the H2O + CO2 + CH 4 Ternary System. *J. Chem. Eng. Data* 2008, *53*, 1246–1249.

(131) Culberson, O. L.; McKetta Jr., J. J. Phase Equilibria in Hydrocarbon-Water Systems. III-The Solubility of Methane in Water at Pressures to 10,000 Psia. *J. Pet. Technol.* 1951, *3*, 223–226.

(132) O'Sullivan, T. D.; Smith, N. O. The Solubility and Partial Molar Volume of Nitrogen and Methane in Water and in Aqueous Sodium Chloride from 50 to 125° and 100 to 600 Atm. *J. Phys. Chem.* 1970, *74*, 1460–1466.

(133) Wang, Y.; Han, B.; Yan, H.; Liu, R. Solubility of CH4 in the Mixed Solvent T-Butyl Alcohol and Water. *Thermochim. Acta* 1995, *253*, 327–334.

(134) Lekvam, K.; Bishnoi, P. R. Dissolution of Methane in Water at Low Temperatures and Intermediate Pressures. *Fluid Phase Equilib.* 1997, *131*, 297–309.

(135) Yarym-Agaev, N. L.; Levinton, R. P.; Koliushko, I. I.; Sinyavskaya, L. Y. Phase Equilibria in the Water-Methane and Methanol-Methane Binary Systems under High Pressures. *Zhurnal Prikl. Khimii* 1985, *58*, 165–168.

(136) Wilhelm, E.; Battino, R.; Wilcock, R. J. Low-Pressure Solubility of Gases in Liquid Water. *Chem. Rev.* 1977, *77*, 219–262.

(137) Abdi, M. A.; Hussain, A.; Hawboldt, K.; Beronich, E. Experimental Study of Solubility of Natural Gas Components in Aqueous Solutions of Ethylene Glycol at Low-Temperature and High-Pressure Conditions. *J. Chem. Eng. Data* 2007, *52*, 1741–1746.

(138) Cosgrove, B. A.; Walkley, J. Solubilities of Gases in H2O and 2H2O. *J. Chromatogr.* 1981, *216*, 161–167.

(139) Davis, J. E.; McKetta, J. J. Solubility of Methane in Water. *Pet. Refin.* 1960, *39*, 205–206.

(140) Wen, W. Y.; Hung, J. H. Thermodynamics of Hydrocarbon Gases in Aqueous Tetraalkylammonium Salt Solutions. *J. Phys. Chem.* 1970, *74*, 170–180.

(141) Li, Z.; Guo, X.; Tian, H. Calculation for Solubility of Methane and Carbon Dioxidein Water in Presence of Hydrate. *Huagong Xuebao* 2010, *61*, 1341–1348.

(142) Amirijafari, B.; Campbell, J. M. Solubility of Gaseous Hydrocarbon Mixtures in Water. *Soc. Pet. Eng. J.* 1972, *12*, 21–27.

(143) Sachs, W.; Meyn, V. Pressure and Temperature Dependence of the Surface Tension in the System Natural Gas/water. Principles of Investigation and the First Precise Experimental Data for Pure Methane/water at 25°C up to 46.8 MPa. *Colloids Surfaces A Physicochem. Eng. Asp.* 1995, *94*, 291–301.

(144) Kiepe, J.; Horstmann, S.; Fischer, K.; Gmehling, J. Experimental Determination and Prediction of Gas Solubility Data for Methane + Water Solutions Containing Different Monovalent Electrolytes. *Ind. Eng. Chem. Res.* 2003, *42*, 5392–5398.

(145) Frolich, K.; Tauch, E. J.; Hogan, J. J.; Peer, A. A. Solubilities of Gases in Liquids at High Pressure. *Ind. Eng. Chem.* 1931, *23*, 548–550.

(146) Michels, A.; Gerver, J.; Bijl, A. The Influence of Pressure on the Solubility of Gases. *Physica* 1936, *3*, 797–808.

(147) Yamamoto, S.; Alcauskas, J. B.; Crozier, T. E. Solubility of Methane in Distilled Water and Seawater. *J. Chem. Eng. Data* 1976, *21*, 78–80.

(148) Schröder, W. Beobachtungen an Lösungen von Gasen in Flüssigkeiten. *Zeitschrift für Naturforsch.* 1969, *24*, 500–508.

(149) Wetlaufer, D. B.; Malik, S. K.; Stoller, L.; Coffin, R. L. Nonpolar Group Participation in the Denaturation of Proteins by Urea and Guanidinium Salts. Model Compound Studies. *J. Am. Chem. Soc.* 1964, *86*, 508–514.

(150) Claussen, W. F.; Polglase, M. F. Solubilities and Structures in Aqueous Aliphatic Hydrocarbon Solutions. *J. Am. Chem. Soc.* 1952, *74*, 4817–4819.

(151) Yaacobi, M.; Ben-Naim, A. Hydrophobic Interaction in Water-Ethanol Mixtures. *J. Solution Chem.* 1973, *2*, 425–443.

(152) Clever, H. L.; Young, C. L. *Solubility Data Series Volume 27/28 Methane*, first.; International Union of Pure and Applied Chemistry, Oxford University Press, 1987; Vol. 27/28.

(153) McDaniel, A. S. Absorption of Hydrocarbon Gases by Non-Aqueous Liquids. *J. Phys. Chem.* 1911, *15*, 587–610.

(154) Yaacobi, M.; Ben-Naim, A. Solvophobic Interaction. *J. Phys. Chem.* 1974, *78*, 175–178.

(155) Cai, J.; Zhang, J.; Song, W. Vapor-Liquid Equilibrium Measurements and Thermodynamic Modeling of the System (Methane + Cyclohexane + Ethanol). *J. Chem. Eng. Data* 2015, *60*, 976–982.

(156) Ukai, T.; Kodama, D.; Miyazaki, J.; Kato, M. Solubility of Methane in Alcohols and Saturated Density at 280.15 K. *J. Chem. Eng. Data* 2002, *47*, 1320–1323.

(157) Nourozieh, H.; Kariznovi, M.; Abedi, J. Phase Equilibrium Measurements and Thermodynamic Modeling of Methane Alcohol Systems at Ambient Temperature. *J. Chem. Thermodyn.* 2012, *54*, 165–170.

(158) Friend, D. G.; Frurip, D. J.; Lemmon, E. W.; Morrison, R. E.; Olson, J. D.; Wilson, L. C. Establishing Benchmarks for the Second Industrial Fluids Simulation Challenge. *Fluid Phase Equilib.* 2005, *236*, 15–24.

(159) Brunner, E.; Hültenschmidt, W. Fluid Mixtures at High Pressures VIII. Isothermal Phase Equilibria in the Binary Mixtures Consisting of (Ethanol+hydrogen or Methane or Ethane). *J. Chem. Thermodyn.* 1990, *22*, 73–84.

(160) Bo, S.; Battino, R.; Wilhelm, E. Solubility of Gases in Liquids. 19. Solubility of He, Ne, Ar, Kr, Xe, N2, O2, CH4, CF4, and SF6 in Normal 1-Alkanols N-ClH2l+1OH ($1 \leq 1 \leq 11$) at 298.15 K. *J. Chem. Eng. Data* 1993, *38*, 611–616.

(161) Boyer, F. L.; Bircher, L. J. The Solubility of Nitrogen, Argon, Methane, Ethylene and Ethane in Normal Primary Alcohols. *J. Phys. Chem.* 1960, *64*, 1330–1331.

(162) Romero, C. M.; Garzon, L. C.; Blanco, L. H.; Suarez, A. F. Solubility of Argon and Nitrogen in Aqueous Solutions of Dodecyltrimethylammonium Bromide (DTAB) from 283.15 to 298.15 K and 101325 Pa Partial Pressure of Gas. *J. Solution Chem.* 2014, *43*, 1147–1155.

(163) Chapoy, A.; Mohammadi, A. H.; Tohidi, B.; Richon, D. Gas Solubility Measurement and Modeling for the Nitrogen + Water System from 274.18 K to 363.02 K. *J. Chem. Eng. Data* 2004, *49*, 1110–1115.

(164) Baranenko, V. I.; Ostretsov, I. N.; Kirov, V. S.; Falkovskii, L. N.; Piontkovskii, A. I. Air Solubility in Water. *Zhurnal Fiz. Khimii* 1990, *64*, 3256–3261.

(165) Farhi, L. E.; Edwards, a W.; Homma, T. Determination of Dissolved N2 in Blood by Gas Chromatography and (a-A)N2 Difference. *J. Appl. Physiol.* 1963, *18*, 97–106.

(166) Fox, C. J. J. On the Coefficients of Absorption of Nitrogen and Oxygen in Distilled Water and Sea-Water, and of Atmospheric Carbonic Acid in Sea-Water. *Trans. Faraday Soc.* 1909, *5*, 68–86.

(167) Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. The Solubility of Helium, Neon, Argon and Krypton in Some Hydrocarbon Solvents. *J. Phys. Chem.* 1957, *61*, 1078–1082.

(168) Klots, C. E.; Benson, B. B. Solubilities of Nitrogen, Oxygen, and Argon in Distilled Water. *J. Mar. Res.* 2016, *21*, 48–57.

(169) Bohr, C. Über Die Löslichkeit von Gasen in Konzentrierter Schwefelsäure Und in Mischungen von Schwefelsäure Und Wasser. *Zeitschrift für Phys. Chemie* 1910, *71*, 47–50.

(170) Wiebe, R.; Gaddy, V. L.; Heins, C. J. The Solubility of Nitrogen in Water at 50, 75 and 100° from 25 to 1000 Atmospheres. *J. Am. Chem. Soc.* 1933, *56*, 947–953.

(171) Fischer, K.; Wilken, M. Experimental Determination of Oxygen and Nitrogen Solubility in Organic Solvents up to 10 MPa at Temperatures between 298 K and 398 K. *J. Chem. Thermodyn.* 2001, *33*, 1285–1308.

(172) Tokunaga, J. Solubilities of Oxygen, Nitrogen, and Carbon Dioxide in Aqueous Alcohol Solutions. *J. Chem. Eng. Data* 1975, *20*, 41–46.

(173) Nitta, T.; Fujio, J.; Katayama, T. Solubilities of Nitrogen in Binary Solutions. Mixtures of Ethanol with Benzene, Ethyl Acetate, and Diethyl Ether. *J. Chem. Eng. Data* 1978, *23*, 157–159.

(174) Kretschmer, C. B.; Nowakowska, J.; Wiebe, R. Solubility of Oxygen and Nitrogen in Organic Solvents from -25° to 50° C. *Ind. Eng. Chem.* 1946, *38*, 506–509.

(175) Katayama, T.; Nitta, T. Solubilities of Hydrogen and Nitrogen in Alcohols and N-Hexane. *J. Chem. Eng. Data* 1976, *21*, 194–196.

(176) Efremova, G. D.; Makarevich, L. A.; Sokolova, E. S. Phase Equilibriums in the System Acetic Acid-nitrogen. *Khimicheskaya Promyshlennost (St. Petersburg, Russ. Fed.* 1961, *37*, 563–564.

(177) DeVaney, W. E. *High Temperature V-L-E Measurements for Substitute Gas Components*; Tulsa, Oklahoma, 1978.

(178) Setthanan, U.; Morris, D. R.; Lister, D. H. Solubilities of H2 in H2O and D2 in D2O with Dissolved Boric Acid and Lithium Hydroxide. *Can. J. Chem.* 2006, *84*, 65–68.

(179) Purwanto; Deshpande, R. M.; Chaudhari, R. V.; Delmas, H. Solubility of Hydrogen, Carbon Monoxide, and 1-Octene in Various Solvents and Solvent Mixtures. *J. Chem. Eng. Data* 1996, *41*, 1414–1417.

(180) Kling, G.; Maurer, G. The Solubility of Hydrogen in Water and in 2-Aminoethanol at Temperatures between 323 K and 423 K and Pressures up to 16 MPa. *J. Chem. Thermodyn.* 1991, *23*, 531–541.

(181) Timofejew, W. Über Die Absorption von Wasserstoff Und Sauerstoff in Wasser Und Alkohol. *Zeitschrift für Phys. Chemie* 1890, *6*, 141–152.

(182) Winkler, L. W. Die Löslichkeit Der Gase in Wasser. *Berichte der Dtsch. Chem. Gesellschaft* 1891, *24*, 89–101.

(183) Geffcken, G. Beiträge Zur Kenntnis Der Löslichkeitsbeeinflussung. *Zeitschrift für Phys. Chemie* 1904, *49*, 257–302.

(184) de Wet, W. J. Determination of Gas Solubilities in Water and Some Organic Liquids. *J. South African Chem. Inst.* 1964, *17*, 9–13.

(185) Ruetschi, P.; Amlie, R. F. Solubility of Hydrogen in Potassium Hydroxide and Sulfuric Acid. Salting-out and Hydration. *J. Phys. Chem.* 1966, *70*, 718–723.

(186) Shoor, S. K.; Walker, R. D. J.; Gubbins, K. E. Salting out of Nonpolar Gases in Aqueous Potassium Hydroxide Solutions. *J. Phys. Chem.* 1969, *73*, 312–317.

(187) Crozier, T. E.; Yamamoto, S. Solubility of Hydrogen in Water, Seawater, and NaCl Solutions. *J. Chem. Eng. Data* 1974, *19*, 242–244.

(188) Gordon, L. I.; Cohen, Y.; Standley, D. R. The Solubility of Molecular Hydrogen in Seawater. *Deep. Res.* 1977, *24*, 937–941.

(189) Wiebe, R.; Gaddy, V. L.; Heins, C. J. Solubility of Hydrogen in Water at 25° C from 25 to 1000 Atmospheres. *Ind. Eng. Chem.* 1932, *24*, 823–825.

(190) Wiebe, R.; Gaddy, V. L. The Solubility of Hydrogen in Water at 0, 50, 75 and 100 °C from 25 to 1000 Atmospheres. *J. Am. Chem. Soc.* 1934, *56*, 76–79.

(191) Pray, H. A.; Schweickert, C. E.; Minnich, B. H. Solubility of Hydrogen, Oxygen, Nitrogen, and Helium in Water at Elevated Temperatures. *Ind. Eng. Chem.* 1952, *44*, 1146–1151.

(192) Alvarez, J.; Crovetto, R.; Fernández-Prini, R. The Dissolution of Nitrogen and of Hydrogen in Water from Room Temperature to 640 K. *Berichte der Bunsengesellschaft für Phys. Chemie* 1988, *82*, 935–940.

(193) Pray, H. A.; Stephan, E. F. *The Solubility of Hydrogen in Uranyl Sulphate Solutions at Elevated Temperatures*; Columbus, Ohio, 1953.

(194) Young, C. L. *Solubility Data Series Volume 5/6 Hydrogen and Deuterium*; International Union of Pure and Applied Chemistry, Oxford University Press, 1981; Vol. 5/6.

(195) Wainwright, M. S.; Ahn, T.; Trimm, D. L.; Cant, N. W. Solubility of Hydrogen in Alcohols and Esters. *J. Chem. Eng. Data* 1987, *32*, 22–24.

(196) Cargill, R. W. Solubility of Helium and Hydrogen in Some Water + Alcohol Systems. *J. Chem. Soc. Faraday Trans. 1 Phys. Chem. Condens. Phases* 1978, *74*, 1444–14.

(197) Maxted, E. B.; Moon, C. H. The Temperature Coefficient of the Solubility of Hydrogen in Organic Solvents. *Trans. Faraday Soc.* 1936, *32*, 769–775.