

# Carbon monoxide

|                      |                             |
|----------------------|-----------------------------|
| Other names:         | CARBON OXIDE                |
|                      | CARBONIC OXIDE              |
|                      | CO                          |
|                      | Carbon monooxide            |
|                      | Carbon oxide (CO)           |
|                      | Carbone (oxyde de)          |
|                      | Carbonio (ossido di)        |
|                      | Exhaust gas                 |
|                      | Flue gas                    |
|                      | Kohlenmonoxid               |
|                      | Kohlenoxyd                  |
|                      | Koolmonoxyde                |
|                      | NA 9202                     |
|                      | Oxyde de carbone            |
|                      | UN 1016                     |
|                      | Wegla tlenek                |
| Inchi:               | InChI=1S/CO/c1-2            |
| InchiKey:            | UGFAIRIUMAVXCW-UHFFFAOYSA-N |
| Formula:             | CO                          |
| SMILES:              | [C]=O                       |
| Mol. weight [g/mol]: | 28.01                       |
| CAS:                 | 630-08-0                    |

## Physical Properties

| Property code | Value          | Unit   | Source       |
|---------------|----------------|--------|--------------|
| af            | 0.0660         |        | KDB          |
| affp          | 594.00         | kJ/mol | NIST Webbook |
| affp          | 426.30         | kJ/mol | NIST Webbook |
| basg          | 562.80         | kJ/mol | NIST Webbook |
| basg          | 402.20         | kJ/mol | NIST Webbook |
| dm            | 0.10           | debye  | KDB          |
| ea            | 1.33           | eV     | NIST Webbook |
| gf            | -137.40        | kJ/mol | KDB          |
| gyrad         | 0.5580         |        | KDB          |
| hf            | -110.60        | kJ/mol | KDB          |
| hf            | -110.53 ± 0.17 | kJ/mol | NIST Webbook |
| hfpi          | 1241.00        | kJ/mol | NIST Webbook |

|         |                 |         |                |
|---------|-----------------|---------|----------------|
| hfpiz   | 1238.00         | kJ/mol  | NIST Webbook   |
| ie      | 14.01           | eV      | NIST Webbook   |
| ie      | 14.01           | eV      | NIST Webbook   |
| ie      | 14.01           | eV      | NIST Webbook   |
| ie      | 14.01           | eV      | NIST Webbook   |
| ie      | 14.00           | eV      | NIST Webbook   |
| ie      | 14.01 ± 0.00    | eV      | NIST Webbook   |
| ie      | 13.98           | eV      | NIST Webbook   |
| ie      | 14.01           | eV      | NIST Webbook   |
| ie      | 14.07 ± 0.05    | eV      | NIST Webbook   |
| ie      | 14.00           | eV      | NIST Webbook   |
| ie      | 14.01           | eV      | NIST Webbook   |
| ie      | 14.10           | eV      | NIST Webbook   |
| ie      | 14.01 ± 0.00    | eV      | NIST Webbook   |
| ie      | 14.01 ± 0.00    | eV      | NIST Webbook   |
| ie      | 14.01           | eV      | NIST Webbook   |
| ie      | 14.00           | eV      | NIST Webbook   |
| log10ws | -4.06           |         | Crippen Method |
| logp    | -0.397          |         | Crippen Method |
| mcvol   | 22.220          | ml/mol  | McGowan Method |
| nfpaf   | %!d(float64=4)  |         | KDB            |
| nfpah   | %!d(float64=2)  |         | KDB            |
| pc      | 3499.00         | kPa     | KDB            |
| pc      | 3498.75 ± 30.39 | kPa     | NIST Webbook   |
| pc      | 3514.96 ± 30.39 | kPa     | NIST Webbook   |
| pc      | 3498.75 ± 30.39 | kPa     | NIST Webbook   |
| pc      | 3521.04 ± 30.39 | kPa     | NIST Webbook   |
| pt      | 15.42           | kPa     | KDB            |
| rhoc    | 310.91 ± 1.12   | kg/m3   | NIST Webbook   |
| sgb     | 197.66 ± 0.00   | J/mol×K | NIST Webbook   |
| tb      | 81.61 ± 0.07    | K       | NIST Webbook   |
| tb      | 81.63 ± 0.05    | K       | NIST Webbook   |
| tb      | 81.60           | K       | KDB            |
| tc      | 132.91          | K       | KDB            |
| tc      | 134.45 ± 0.40   | K       | NIST Webbook   |
| tf      | 68.00           | K       | KDB            |
| tt      | 68.12 ± 0.05    | K       | NIST Webbook   |
| tt      | 68.09 ± 0.07    | K       | NIST Webbook   |
| tt      | 68.15           | K       | KDB            |
| tt      | 67.95 ± 0.06    | K       | NIST Webbook   |
| vc      | 0.093           | m3/kmol | KDB            |
| zc      | 0.2944640       |         | KDB            |
| zra     | 0.29            |         | KDB            |

# Temperature Dependent Properties

| Property code | Value   | Unit   | Temperature [K] | Source                                                                                         |
|---------------|---------|--------|-----------------|------------------------------------------------------------------------------------------------|
| hsubt         | 7.60    | kJ/mol | 57.50           | NIST Webbook                                                                                   |
| hsubt         | 8.10    | kJ/mol | 59.50           | NIST Webbook                                                                                   |
| hsubt         | 7.90    | kJ/mol | 62.50           | NIST Webbook                                                                                   |
| hvapt         | 6.04    | kJ/mol | 81.60           | KDB                                                                                            |
| hvapt         | 6.00    | kJ/mol | 88.00           | NIST Webbook                                                                                   |
| hvapt         | 6.00    | kJ/mol | 76.00           | NIST Webbook                                                                                   |
| hvapt         | 6.00    | kJ/mol | 81.00           | NIST Webbook                                                                                   |
| pvap          | 2682.00 | kPa    | 127.32          | Phase Equilibrium of Three Binary Mixtures Containing NO and Components Present in Ambient Air |
| pvap          | 830.00  | kPa    | 105.89          | Phase Equilibrium of Three Binary Mixtures Containing NO and Components Present in Ambient Air |
| rhoI          | 803.00  | kg/m3  | 81.00           | KDB                                                                                            |
| srf           | 0.01    | N/m    | 85.20           | KDB                                                                                            |

# Correlations

| Information                 | Value                         |
|-----------------------------|-------------------------------|
| Property code               | pvap                          |
| Equation                    | $\ln(P_{vp}) = A + B/(T + C)$ |
| Coeff. A                    | 1.34775e+01                   |
| Coeff. B                    | -6.79787e+02                  |
| Coeff. C                    | -4.90700e+00                  |
| Temperature range (K), min. | 56.45                         |
| Temperature range (K), max. | 132.86                        |

# Datasets

## Viscosity, Pa\*s

| Mass density, kg/m3 - Gas | Temperature, K - Gas | Viscosity, Pa*s - Gas |
|---------------------------|----------------------|-----------------------|
| 0.5200000                 | 292.39               | 0.0000175             |
| 0.5200000                 | 296.81               | 0.0000177             |
| 0.5200000                 | 323.95               | 0.0000189             |
| 0.5200000                 | 350.09               | 0.0000201             |
| 0.5200000                 | 377.81               | 0.0000212             |
| 0.5200000                 | 297.19               | 0.0000177             |
| 0.5200000                 | 405.55               | 0.0000224             |
| 0.5200000                 | 433.45               | 0.0000234             |
| 0.5200000                 | 298.58               | 0.0000178             |
| 0.5200000                 | 461.45               | 0.0000245             |
| 0.5200000                 | 489.81               | 0.0000256             |
| 0.5200000                 | 298.54               | 0.0000178             |
| 0.5200000                 | 518.44               | 0.0000266             |
| 0.5200000                 | 542.05               | 0.0000274             |
| 0.5200000                 | 299.09               | 0.0000178             |
| 0.5200000                 | 299.27               | 0.0000178             |
| 0.5200000                 | 593.37               | 0.0000292             |
| 0.5200000                 | 622.50               | 0.0000301             |
| 0.5200000                 | 296.74               | 0.0000177             |
| 0.5200000                 | 651.68               | 0.0000311             |
| 0.5200000                 | 681.07               | 0.0000320             |
| 0.5200000                 | 288.72               | 0.0000173             |
| 0.7800000                 | 296.53               | 0.0000177             |
| 0.7800000                 | 323.27               | 0.0000189             |
| 0.7800000                 | 349.98               | 0.0000201             |
| 0.7800000                 | 377.57               | 0.0000212             |
| 0.7800000                 | 405.30               | 0.0000224             |
| 0.7800000                 | 433.29               | 0.0000235             |
| 0.7800000                 | 296.67               | 0.0000177             |
| 0.7800000                 | 461.39               | 0.0000245             |
| 0.7800000                 | 489.68               | 0.0000256             |
| 0.7800000                 | 518.13               | 0.0000266             |
| 0.7800000                 | 542.09               | 0.0000274             |
| 0.7800000                 | 564.73               | 0.0000282             |
| 0.7800000                 | 593.52               | 0.0000292             |

|           |        |           |
|-----------|--------|-----------|
| 0.7800000 | 622.67 | 0.0000302 |
| 0.7800000 | 651.51 | 0.0000311 |
| 0.7800000 | 680.94 | 0.0000320 |
| 0.7800000 | 288.91 | 0.0000173 |

Reference

<https://www.doi.org/10.1007/s10765-012-1185-1>

## Kinematic viscosity, m2/s

| Temperature, K - Gas | Pressure, kPa - Gas | Kinematic viscosity, m2/s - Gas |
|----------------------|---------------------|---------------------------------|
| 225.00               | 250.04              | 0.0000037                       |
| 225.00               | 371.90              | 0.0000025                       |
| 225.00               | 499.99              | 0.0000019                       |
| 225.00               | 560.56              | 0.0000017                       |
| 225.00               | 743.07              | 0.0000013                       |
| 225.00               | 750.00              | 0.0000012                       |
| 225.00               | 934.61              | 0.0000010                       |
| 225.00               | 1000.00             | 0.0000009                       |
| 225.00               | 1141.55             | 0.0000008                       |
| 225.00               | 1250.00             | 0.0000007                       |
| 225.00               | 1345.57             | 0.0000007                       |
| 225.00               | 1500.00             | 0.0000006                       |
| 225.00               | 1581.46             | 0.0000006                       |
| 225.00               | 1750.00             | 0.0000005                       |
| 225.00               | 1787.07             | 0.0000005                       |
| 225.00               | 2000.00             | 0.0000005                       |
| 225.00               | 2016.09             | 0.0000005                       |
| 225.00               | 2263.97             | 0.0000004                       |
| 225.00               | 2454.70             | 0.0000004                       |
| 250.00               | 221.65              | 0.0000054                       |
| 250.00               | 401.55              | 0.0000029                       |
| 250.00               | 587.83              | 0.0000020                       |
| 250.00               | 791.25              | 0.0000014                       |
| 250.00               | 982.55              | 0.0000012                       |
| 250.00               | 1169.11             | 0.0000010                       |
| 250.00               | 1392.31             | 0.0000008                       |
| 250.00               | 1587.81             | 0.0000007                       |
| 250.00               | 1808.18             | 0.0000006                       |
| 250.00               | 2050.14             | 0.0000006                       |
| 250.00               | 2241.48             | 0.0000005                       |
| 275.00               | 250.64              | 0.0000050                       |

|        |         |           |
|--------|---------|-----------|
| 275.00 | 286.53  | 0.0000044 |
| 275.00 | 465.90  | 0.0000028 |
| 275.00 | 500.41  | 0.0000027 |
| 275.00 | 652.16  | 0.0000021 |
| 275.00 | 750.00  | 0.0000018 |
| 275.00 | 832.04  | 0.0000016 |
| 275.00 | 1000.00 | 0.0000014 |
| 275.00 | 1045.38 | 0.0000013 |
| 275.00 | 1250.00 | 0.0000011 |
| 275.00 | 1252.24 | 0.0000011 |
| 275.00 | 1443.14 | 0.0000009 |
| 275.00 | 1500.00 | 0.0000009 |
| 275.00 | 1675.00 | 0.0000008 |
| 275.00 | 1750.00 | 0.0000008 |
| 275.00 | 1882.65 | 0.0000007 |
| 275.00 | 2000.00 | 0.0000007 |
| 275.00 | 2150.85 | 0.0000006 |
| 275.00 | 2364.73 | 0.0000006 |
| 300.00 | 252.56  | 0.0000067 |
| 300.00 | 501.19  | 0.0000032 |
| 300.00 | 709.53  | 0.0000023 |
| 300.00 | 1000.01 | 0.0000016 |
| 300.00 | 1178.09 | 0.0000014 |
| 300.00 | 1250.01 | 0.0000013 |
| 300.00 | 1373.95 | 0.0000012 |
| 300.00 | 1481.47 | 0.0000011 |
| 300.00 | 1500.00 | 0.0000011 |
| 300.00 | 1602.13 | 0.0000010 |
| 300.00 | 1730.28 | 0.0000010 |
| 300.00 | 1750.00 | 0.0000009 |
| 300.00 | 1868.03 | 0.0000009 |
| 300.00 | 2000.00 | 0.0000008 |
| 300.00 | 2005.34 | 0.0000008 |
| 325.00 | 303.08  | 0.0000059 |
| 325.00 | 515.56  | 0.0000035 |
| 325.00 | 732.01  | 0.0000025 |
| 325.00 | 943.23  | 0.0000019 |
| 325.00 | 1169.67 | 0.0000016 |
| 325.00 | 1401.15 | 0.0000013 |
| 325.00 | 1633.88 | 0.0000011 |
| 325.00 | 1908.67 | 0.0000010 |
| 325.00 | 2129.59 | 0.0000009 |
| 325.00 | 2413.09 | 0.0000008 |
| 350.00 | 342.40  | 0.0000060 |

|        |         |           |
|--------|---------|-----------|
| 350.00 | 544.10  | 0.0000038 |
| 350.00 | 775.52  | 0.0000027 |
| 350.00 | 1007.12 | 0.0000021 |
| 350.00 | 1245.13 | 0.0000017 |
| 350.00 | 1461.54 | 0.0000014 |
| 350.00 | 1735.08 | 0.0000012 |
| 350.00 | 1995.63 | 0.0000011 |
| 350.00 | 2208.19 | 0.0000010 |
| 350.00 | 2464.21 | 0.0000009 |
| 375.00 | 260.28  | 0.0000085 |
| 375.00 | 460.71  | 0.0000050 |
| 375.00 | 672.43  | 0.0000034 |
| 375.00 | 885.97  | 0.0000026 |
| 375.00 | 1102.86 | 0.0000021 |
| 375.00 | 1302.30 | 0.0000018 |
| 375.00 | 1537.48 | 0.0000015 |
| 375.00 | 1815.58 | 0.0000013 |
| 375.00 | 2026.16 | 0.0000012 |
| 375.00 | 2250.59 | 0.0000010 |
| 375.00 | 2518.19 | 0.0000009 |

Reference

<https://www.doi.org/10.1016/j.jct.2007.07.002>

## Sources

Solubilities of gases in novel alcamines ionic liquids 2-[2-hydroxyethyl (methyl) amino]ethanol. **Chen, G.** **Am. J. Chem. Eng. 2010, 108, 1-10.**  
 Solubility of Carbon Monoxide in Methanol and Modeling of the Vapor-Liquid Equilibrium of (CO<sub>2</sub> + CO) at Temperatures between (218.15 and 302.93) K at pressures up to 15 MPa: The Experimental Study of Temperature Dependence of Binary Diffusion Coefficients of Gases in Bio-oil compounds at pressures: (p, rho, T) Behavior of Two Mixtures of Carbon Monoxide with Nitrogen in the Temperature Range (218.15-302.93) K and Pressures up to 20 MPa. **Equilibrium (VLE) Data for the Binary Systems of Carbon Monoxide with Hexane and Carbon Dioxide for the Hydroesterification of 10-Undecenoic Methyl Ester and Solubility of Slightly Soluble Gases in Thermal and Mutual Diffusivity of Binary Mixtures of n-Dodecane and Nitrogen with Carbon Monoxide, Hydrogen, and Water from Dynamic Vapour Scattering Equilibrium (P-T-x) Measurements and Modeling for the Solubility of the Single Gases Carbon Monoxide and Oxygen in the Ionic Liquids 1-butyl-3-methylimidazolium tetrafluoroborate between temperatures 283 K and 343 K and at pressures close to atmospheric:**

<https://www.doi.org/10.1016/j.fluid.2010.08.017>  
<https://www.doi.org/10.1021/je200764g>  
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[https://www.chemeo.com/doc/models/crippen\\_log10ws](https://www.chemeo.com/doc/models/crippen_log10ws)  
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<https://www.doi.org/10.1016/j.jct.2005.07.002>

## NIST Webbook:

Low-pressure solubilities and thermodynamics of solvation of eight gases in binary 1-methylimidazole/6-oxo-1,2,3,4-tetrahydropyridine and Nitrogen at Low Density: Gas-Phase Measurements of Some and Gas-Liquid Measurements of Carbon Dioxide, Carbon Monoxide, and Hydrogen and Semiquantitative Estimation of Their Solvent Power of Carbon Monoxide. Parameter Estimation of the Thermodynamic and Thermodynamic Modeling for Binary Systems Containing Humidified Ethane (R610) with Carbon Monoxide or Nitric Oxide at 293, 313, and 333 K and 0.1 MPa for the binary systems of (carbon monoxide and nitrogen) in the liquid phase and (carbon monoxide and nitrogen) in the gas phase. Modeling of the gas-liquid equilibrium of (0.95 N<sub>2</sub> + 0.05 CO and 0.9 N<sub>2</sub> + 0.1 CO) gas mixtures at T = 253, 273, 283, and 298 K and pressures up to 10 MPa. Equilibrium and Thermodynamic Properties of CO and H<sub>2</sub> in N<sub>2</sub> and CO<sub>2</sub>-Expanded Hydroformylation Reactions of the single gases H<sub>2</sub> and CO in the liquid phase at 0.1 MPa. Low pressure solubility and thermodynamics of solvation of experimental and correlations of the vapor-liquid equilibria for Carbon Monoxide, Carbon Dioxide, and Carbon Monoxide and Carbon Dioxide. CO<sub>2</sub>-N<sub>2</sub> System at the temperatures 253, 273, 283 and 298 K and pressures up to 15 MPa. Equilibrium Data of the Binary Systems in Oxidative Coupling of Ethanol and Ethanol with Gaseous CO<sub>2</sub>, CO, SF<sub>6</sub>, C<sub>2</sub>H<sub>6</sub>, and NH<sub>3</sub> from 220 K to 375 K and pressures up to 3.4 MPa. Effects of association with impurities in ammonia purification:

<http://webbook.nist.gov/cgi/cbook.cgi?ID=C630080&Units=SI>

<https://www.doi.org/10.1016/j.fluid.2005.12.003>

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<https://www.doi.org/10.1021/je8002282>

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<https://www.doi.org/10.1016/j.fluid.2015.07.034>

## Legend

|        |                                                              |
|--------|--------------------------------------------------------------|
| af:    | Acentric Factor                                              |
| affp:  | Proton affinity                                              |
| basg:  | Gas basicity                                                 |
| dm:    | Dipole Moment                                                |
| dvisc: | Dynamic viscosity                                            |
| ea:    | Electron affinity                                            |
| gf:    | Standard Gibbs free energy of formation                      |
| gyrad: | Radius of Gyration                                           |
| hf:    | Enthalpy of formation at standard conditions                 |
| hfpi:  | Enthalpy of formation of positive ion at standard conditions |
| hfpi:  | Enthalpy of formation of positive ion at 0K                  |
| hsbt:  | Enthalpy of sublimation at a given temperature               |
| hvapt: | Enthalpy of vaporization at a given temperature              |
| ie:    | Ionization energy                                            |
| kvisc: | Kinematic viscosity                                          |



|                 |                                              |
|-----------------|----------------------------------------------|
| <b>log10ws:</b> | Log10 of Water solubility in mol/l           |
| <b>logp:</b>    | Octanol/Water partition coefficient          |
| <b>mcvol:</b>   | McGowan's characteristic volume              |
| <b>nfpaf:</b>   | NFPA Fire Rating                             |
| <b>nfpah:</b>   | NFPA Health Rating                           |
| <b>pc:</b>      | Critical Pressure                            |
| <b>pt:</b>      | Triple Point Pressure                        |
| <b>pvap:</b>    | Vapor pressure                               |
| <b>rhoc:</b>    | Critical density                             |
| <b>rho:</b>     | Liquid Density                               |
| <b>sgb:</b>     | Molar entropy at standard conditions (1 bar) |
| <b>srf:</b>     | Surface Tension                              |
| <b>tb:</b>      | Normal Boiling Point Temperature             |
| <b>tc:</b>      | Critical Temperature                         |
| <b>tf:</b>      | Normal melting (fusion) point                |
| <b>tt:</b>      | Triple Point Temperature                     |
| <b>vc:</b>      | Critical Volume                              |
| <b>zc:</b>      | Critical Compressibility                     |
| <b>zra:</b>     | Rackett Parameter                            |

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