Terry Tope
3/23/06

Nitrogen-Argon Mixture Saturation Properties

Temperature Kelvin	Pressure psia	Vapor Phase PPM_W N_2	Liquid Phase PPM_W N_2	Vapor to Liquid Ratio
89.000	22.12	231850	95063	2.44
89.000	18.09	32263	10930	2.95
89.000	17.57	3060.1	1010	3.03
89.000	17.52	303.98	100.09	3.04
89.000	17.49	30.504	10.001	3.05
89.000	17.49	3.050870198	0.999999	3.05
89.000	17.49	0.305094591	0.09999999	3.05
89.000	17.49	0.030509534	0.01	3.05
86.426	17.00	232670	90909	2.56
88.386	17.00	32514	10880	2.99
88.675	17.00	3080.3	1010	3.05
88.702	17.00	305.84	100.09	3.06
88.719	17.00	30.68141927	10.00090008	3.07
88.722	17.00	3.068476339	1.000009	3.07
88.722	17.00	0.306850674	0.09999999	3.07
88.722	17.00	0.030685128	0.01	3.07

Oxygen-Argon Mixture Saturation Properties

Temperature Kelvin	Pressure psia	Vapor Phase PPM_W O2	Liquid Phase PPM_W O2	Vapor to Liquid Ratio
89.000	17.19	107140	123290	0.87
89.000	17.49	11076	12359	0.90
89.000	17.52	908.75	1010.2	0.90
89.000	17.52	90.066	100.09	0.90
89.000	17.49	9.026761772	10.00090008	0.90
89.000	17.49	0.902773274	1.000009	0.90
89.000	17.49	0.090278209	0.09999999	0.90
89.000	17.49	0.009027839	0.01	0.90
89.000	17.49	0.000902785	0.001000001	0.90
88.851	17.00	86567	99099	0.87
88.719	17.00	9834.3	10978	0.90
88.706	17.00	1010.078586	1123.83862	0.90
88.705	17.00	89.99069778	100.0910908	0.90
88.720	17.00	9.019803383	10.00090099	0.90
88.722	17.00	0.902083817	1.000009001	0.90
88.722	17.00	0.090209418	0.10000009	0.90
88.722	17.00	0.00902096	0.01000001	0.90
88.722	17.00	0.000902096	0.001000001	0.90

CO_2-Argon Mixture Saturation Properties

Due to a critical temperature ratio > 2, errors are possible for Ar/CO_2

Temperature Kelvin	Pressure psia	Vapor Phase PPM_W CO_2	Liquid Phase PPM_W CO_2	Vapor to Liquid Ratio
89.000	17.22	2.245607705	19607.84	1.15E-04
89.000	17.50	0.133403052	1001.00	1.33E-04
89.000	17.51	0.013438361	100.09	1.34E-04
89.000	17.49	0.001345345	10.00	1.35E-04
89.000	17.49	0.000134562	1.00	1.35E-04
89.000	17.49	1.34564E-05	0.10	1.35E-04
89.000	17.49	1.34565E-06	0.01	1.35E-04
88.793	17.00	1.18443262	9901.97	1.20E-04
88.714	17.00	0.126773848	999.10	1.27E-04
88.707	17.00	0.012768844	100.00	1.28E-04
88.721	17.00	0.001282374	10.00	1.28E-04
88.722	17.00	0.000128292	1.00	1.28E-04
88.722	17.00	1.28298E-05	0.10	1.28E-04
88.722	17.00	1.28298E-06	0.01	1.28E-04

Source of tabulated data:
NIST Reference Fluid Thermodynamic and Transport Properties Database (REFPROP): Version 7.0

Nitrogen in Argon at constant temperature

Specified Bulk Mass Fraction Ar	% N2	PPMw N2	Temperature Liquid phase K	Temperature Vapor phase K	Pressure Liquid phase psia	Pressure Vapor phase psia	Density Liquid phase kg/m3	Density Vapor phase kg/m3	Enthalpy Liquid phase KJ/kg	Enthalpy Vapor phase KJ/kg	Entropy Liquid phase KJ/kg-K	Entropy Vapor phase KJ/kg-K	Liquid Phase Mass Fraction Argon	Liquid Phase Mass Fraction Nitrogen	Vapor Phase Mass Fraction Argon	Vapor Phase Mass Fraction Nitrogen	Ar/N2 Liquid ratio	Ar/N2 Vapor ratio	Liquid/Vapor ratio	PPMw N2 Vapor	PPMw N2 Liquid
0.9049400000	0.095063	9.5063	95063.00	89	89	22.124	22.124	1286.600	7.870	4.9006	179.02	0.055904	2.1318	0.904940000	0.095063	0.76815000	0.232	9.519371	3.31E+00	2.87	231850	95063
0.9890700000	0.01093	1.093	10930.00	89	89	18.093	18.093	1372.900	6.919	2.2875	164.31	0.025805	1.8795	0.989070000	0.01093	0.96774000	0.032	90.49131	3.00E+01	3.02	32263	10930
0.9989900000	1.010E-03	0.101	1010.00	89	89	17.572	17.572	1383.800	6.796	1.9428	161.99	0.021882	1.8248	0.998990000	0.00101	0.99694000	3.060E-03	989.099	3.26E+02	3.04	3060.1	1010
0.9999000000	1.001E-04	0.010009	100.09	89	89	17.523	17.523	1384.800	6.784	1.9107	161.77	0.021517	1.8183	0.999900000	1.001E-04	0.99970000	3.040E-04	9990.009	3.29E+03	3.04	303.98	100.09
0.9999900000	1.000E-05	1.000E-03	10.00	89	89	17.493	17.493	1384.900	6.773	1.8908	161.74	0.021292	1.8177	0.999990000	1.000E-05	0.99996950	3.050E-05	99989	3.28E+04	3.05	30.504	10.001
0.9999990000	1.000E-06	1.000E-04	1.00	89	89	17.488	17.488	1384.900	6.771	1.888	161.73	0.021259	1.8176	0.999999000	1.000E-06	0.99999695	3.051E-06	1000000	3.28E+05	3.05	3.05087	0.999999
0.9999999000	1.000E-07	1.000E-05	0.10	89	89	17.488	17.488	1384.900	6.771	1.8877	161.73	0.021256	1.8176	0.999999900	1.000E-07	0.99999969	3.051E-07	10000000	3.28E+06	3.05	0.305095	0.1
0.9999999900	1.000E-08	1.000E-06	0.01	89	89	17.488	17.488	1384.900	6.771	1.8877	161.73	0.021256	1.8176	0.999999990	1.000E-08	0.99999997	3.051E-08	1E+08	3.28E+07	3.05	0.03051	0.01

Nitrogen in Argon at constant pressure

Specified Bulk Mass Fraction Ar	% N2	PPMw N2	Temperature Liquid phase K	Temperature Vapor phase K	Pressure Liquid phase psia	Pressure Vapor phase psia	Density Liquid phase kg/m3	Density Vapor phase kg/m3	Enthalpy Liquid phase KJ/kg	Enthalpy Vapor phase KJ/kg	Entropy Liquid phase KJ/kg-K	Entropy Vapor phase KJ/kg-K	Liquid Phase Mass Fraction Argon	Liquid Phase Mass Fraction Nitrogen	Vapor Phase Mass Fraction Argon	Vapor Phase Mass Fraction Nitrogen	Ar/N2 Liquid ratio	Ar/N2 Vapor ratio	Liquid/Vapor ratio	PPMw N2 Vapor	PPMw N2 Liquid
0.9090910000	0.090909	9.0909	90909.00	86.4260	86.4260	17	17	1306.100	6.173	1.6823	178.18	0.019484	2.1843	0.909090000	0.090909	0.76733000	0.233	10	3.30E+00	3.03	232670	90909
0.9891200000	0.01088	1.088	10880.00	88.3860	88.3860	17	17	1376.700	6.533	1.5895	164.12	0.017997	1.8904	0.989120000	0.01088	0.96749000	0.033	90.91176	2.98E+01	3.06	32514	10880
0.9989900000	1.010E-03	0.101	1010.00	88.6750	88.6750	17	17	1385.800	6.592	1.5766	161.88	0.017792	1.8302	0.998990000	0.00101	0.99692000	3.080E-03	989.099	3.24E+02	3.06	3080.3	1010
0.9998999100	1.001E-04	0.010009	100.09	88.7020	88.7020	17	17	1386.600	6.598	1.5754	161.67	0.017773	1.8232	0.999900000	1.001E-04	0.99969000	3.058E-04	9990.009	3.27E+03	3.06	305.84	100.09
0.9999899990	1.000E-05	1.000E-03	10.00	88.7190	88.7190	17	17	1386.600	6.597	1.5751	161.64	0.017766	1.8223	0.999989999	1.000E-05	0.99996932	3.068E-05	99990	3.26E+04	3.07	30.68142	10.0009
0.9999990000	1.000E-06	1.000E-04	1.00	88.7220	88.7220	17	17	1386.600	6.597	1.5751	161.63	0.017765	1.8222	0.999999000	1.000E-06	0.99999693	3.068E-06	999990	3.26E+05	3.07	3.068476	1.000009
0.9999999000	1.000E-07	1.000E-05	0.10	88.7220	88.7220	17	17	1386.600	6.597	1.5751	161.63	0.017765	1.8222	0.999999900	1.000E-07	0.99999969	3.069E-07	10000000	3.26E+06	3.07	0.306851	0.1
0.9999999900	1.000E-08	1.000E-06	0.01	88.7220	88.7220	17	17	1386.600	6.597	1.5751	161.63	0.017765	1.8222	0.999999990	1.000E-08	0.99999997	3.069E-08	1E+08	3.26E+07	3.07	0.030685	0.01

Oxygen in Argon at constant temperature

Specified Bulk Mass Fraction Ar	% O2	PPMw O2	Temperature Liquid phase K	Temperature Vapor phase K	Pressure Liquid phase psia	Pressure Vapor phase psia	Density Liquid phase kg/m3	Density Vapor phase kg/m3	Enthalpy Liquid phase KJ/kg	Enthalpy Vapor phase KJ/kg	Entropy Liquid phase KJ/kg-K	Entropy Vapor phase KJ/kg-K	Liquid Phase Mass Fraction Argon	Liquid Phase Mass Fraction O2	Vapor Phase Mass Fraction Argon	Vapor Phase Mass Fraction O2	Ar/O2 Liquid ratio	Ar/O2 Vapor ratio	Liquid/Vapor ratio	PPMw O2 Vapor	PPMw O2 Liquid
0.8928600000	0.107	10.714	107140.00	89	89	17.188	17.188	1347.200	6.478	2.0626	166.69	0.047007	1.8732	0.876710000	0.12329	0.892860000	0.107	7.110958	8.33E+00	0.85	107140	123290
0.9889240000	0.011	1.1076	11076.00	89	89	17.489	17.489	1380.900	6.753	1.9235	162.25	0.024377	1.8231	0.987640000	0.012359	0.988920000	0.011	79.91261	8.93E+01	0.90	11076	12359
0.9989898000	1.010E-03	0.10102	1010.20	89	89	17.516	17.516	1384.600	6.780	1.9066	161.79	0.021471	1.8176	0.998990000	0.0010102	0.999090000	9.088E-04	988.9032	1.10E+03	0.90	908.75	1010.2
0.9998999100	1.001E-04	0.010009	100.09	89	89	17.518	17.518	1384.800	6.783	1.9071	161.75	0.021476	1.8174	0.999900000	1.001E-04	0.999910000	9.007E-05	9990.009	1.11E+04	0.90	90.066	100.09
0.9999899990	1.000E-05	1.000E-03	10.00	89	89	17.492	17.492	1384.900	6.772	1.8901	161.73	0.021283	1.8176	0.999989999	1.000E-05	0.999990973	9.027E-06	99990	1.11E+05	0.90	9.026762	10.0009
0.9999990000	1.000E-06	1.000E-04	1.00	89	89	17.488	17.488	1384.900	6.771	1.8879	161.73	0.021258	1.8176	0.999999000	1.000E-06	0.999999097	9.028E-07	999990	1.11E+06	0.90	0.902773	1.000009
0.9999999000	1.000E-07	1.000E-05	0.10	89	89	17.488	17.488	1384.900	6.771	1.8877	161.73	0.021256	1.8176	0.999999900	1.000E-07	0.999999910	9.028E-08	10000000	1.11E+07	0.90	0.090278	0.1
0.9999999900	1.000E-08	1.000E-06	0.01	89	89	17.488	17.488	1384.900	6.771	1.8877	161.73	0.021256	1.8176	0.999999990	1.000E-08	0.999999991	9.028E-09	1E+08	1.11E+08	0.90	0.009028	0.01
0.9999999990	1.000E-09	1.000E-07	0.001	89	89	17.488	17.488	1384.872	6.771	1.8877	161.73	0.021256	1.8176	0.999999999	1.000E-09	0.999999999	9.028E-10	1E+09	1.11E+09	0.90	0.000903	0.001

Oxygen in Argon at constant pressure

Specified Bulk Mass Fraction Ar	% O2	PPMw O2	Temperature Liquid phase K	Temperature Vapor phase K	Pressure Liquid phase psia	Pressure Vapor phase psia	Density Liquid phase kg/m3	Density Vapor phase kg/m3	Enthalpy Liquid phase KJ/kg	Enthalpy Vapor phase KJ/kg	Entropy Liquid phase KJ/kg-K	Entropy Vapor phase KJ/kg-K	Liquid Phase Mass Fraction Argon	Liquid Phase Mass Fraction O2	Vapor Phase Mass Fraction Argon	Vapor Phase Mass Fraction O2	Ar/O2 Liquid ratio	Ar/O2 Vapor ratio	Liquid/Vapor ratio	PPMw O2 Vapor	PPMw O2 Liquid
0.9009010000	0.099099	9.9099	99099.00	88.851	88.851	17	17	1355.200	6.448	1.6535	165.46	0.018625	1.8432	0.900900000	0.099099	0.913430000	0.087	9.090909	1.06E+01	0.86	86567	99099
0.9890219780	0.010978022	1.097802196	10978.02	88.719	88.719	17	17	1383.100	6.581	1.5839	162.07	0.017865	1.8244	0.989020000	0.010978	0.990170000	0.010	90.09109	1.01E+02	0.89	9834.3	10978
0.9989899214	1.010E-03	0.101007859	1010.08	88.70633564	88.70633564	17	17	1386.341	6.597	1.5782	161.69	0.018116	1.8228	0.998876161	0.0011238	0.998989921	1.010E-03	888.8075	9.89E+02	0.90	1010.079	1123.839
0.9998999089	1.001E-04	0.010009109	100.09	88.70501324	88.70501324	17	17	1386.677	6.598	1.5754	161.65	0.017772	1.8223	0.999899909	0.0001001	0.999910009	8.999E-05	9989.899	1.11E+04	0.90	89.9907	100.0911
0.9999899991	1.000E-05	1.000E-03	10.00	88.71986253	88.71986253	17	17	1386.613	6.597	1.5751	161.64	0.017766	1.8222	0.999989999	1.000E-05	0.999990980	9.020E-06	99989.99	1.11E+05	0.90	9.019803	10.0009
0.9999990000	1.000E-06	1.000E-04	1.00	88.72177027	88.72177027	17	17	1386.604	6.597	1.5751	161.63	0.017765	1.8222	0.999999000	1.000E-06	0.999999098	9.021E-07	999990	1.11E+06	0.90	0.902084	1.000009
0.9999999000	1.000E-07	1.000E-05	0.10	88.72196112	88.72196112	17	17	1386.603	6.597	1.5751	161.63	0.017765	1.8222	0.999999900	1.000E-07	0.999999910	9.021E-08	9999990	1.11E+07	0.90	0.090209	0.1
0.9999999900	1.000E-08	1.000E-06	0.01	88.72198009	88.72198009	17	17	1386.603	6.597	1.5751	161.63	0.017765	1.8222	0.999999990	1.000E-08	0.999999991	9.021E-09	99999900	1.11E+08	0.90	0.009021	0.01
0.9999999990	1.000E-09	1.000E-07	0.001	88.72198198	88.72198198	17	17	1386.603	6.597	1.5751	161.63	0.017765	1.8222	0.999999999	1.000E-09	0.999999999	9.021E-10	1E+09	1.11E+09	0.90	0.000902	0.001

Carbon Dioxide in Argon at constant temperature

Specified Bulk Mass Fraction Ar	% CO2	PPMw CO2	Temperature Liquid phase K	Temperature Vapor phase K	Pressure Liquid phase psia	Pressure Vapor phase psia	Density Liquid phase kg/m3	Density Vapor phase kg/m3	Enthalpy Liquid phase KJ/kg	Enthalpy Vapor phase KJ/kg	Entropy Liquid phase KJ/kg-K	Entropy Vapor phase KJ/kg-K	Liquid Phase Mass Fraction Argon	Liquid Phase Mass Fraction CO2	Vapor Phase Mass Fraction Argon	Vapor Phase Mass Fraction CO2	Ar/CO2 Liquid ratio	Ar/CO2 Vapor ratio	Liquid/Vapor ratio	PPMw CO2 Vapor	PPMw CO2 Liquid
0.9803921569	0.019607843	1.961E+00	19607.843	89	89	17.22018371	17.22018371	1392.695724	6.662811298	-114.178039	44.26487384	1.370521093	3.196282038	0.980392157	0.0196078	0.9999977544	2.24561E-06	50	4.45E+05	0.0001123	2.245608	19607.84
0.9989990030	0.001000997	1.001E-01	1000.997	89	89	17.50132215	17.50132215	1385.281354	6.776167946	-115.537823	44.22917105	1.395719391	3.192644121	0.998999003	0.001001	0.9999998666	1.33403E-07	998.004	7.50E+06	0.0001331	0.133403	1001.00
0.9998999098	0.00010009	1.001E-02	100.090	89	89	17.51346381	17.51346381	1384.91391	6.781067115	-115.605238	44.22761901	1.396444983	3.192488119	0.99989991	0.0001001	0.9999998866	1.34384E-08	9989.99	7.44E+07	0.0001342	0.013438	100.09
0.9999899991	1.00009E-05	1.000E-03	10.001	89	89	17.49033916	17.49033916	1384.876603	6.771736249	-115.612059	44.23050247	1.396478873	3.192784898	0.999989999	1E-05	0.9999999987	1.34535E-09	99989.99	7.43E+08	0.0001345	0.001345	10.00
0.9999989999	1.00009E-06	1.000E-04	1.000	89	89	17.48803251	17.48803251	1384.872875	6.77080557	-115.612741	44.23079006	1.396478342	3.19281452	0.999999	1E-06	0.9999999999	1.34562E-10	999899.9	7.43E+09	0.0001345	0.000135	1.00
0.9999999000	1.0001E-07	1.000E-05	0.100	89	89	17.48780187	17.48780187	1384.872503	6.770712514	-115.612809	44.23081882	1.396477898	3.192817482	0.9999999	1E-07	1.0000000000	1.34564E-11	9998999	7.43E+10	0.0001346	1.35E-05	0.10
0.9999999900	1.0001E-08	1.000E-06	0.010	89	89	17.48777882	17.48777882	1384.872465	6.770703211	-115.612816	44.23082169	1.396477814	3.192817778	0.99999999	1E-08	1.0000000000	1.34565E-12	99989991	7.43E+11	0.0001346	1.35E-06	0.01

Carbon Dioxide in Argon at constant pressure

Specified Bulk Mass Fraction Ar	% CO2	PPMw CO2	Temperature Liquid phase K	Temperature Vapor phase K	Pressure Liquid phase psia	Pressure Vapor phase psia	Density Liquid phase kg/m3	Density Vapor phase kg/m3	Enthalpy Liquid phase KJ/kg	Enthalpy Vapor phase KJ/kg	Entropy Liquid phase KJ/kg-K	Entropy Vapor phase KJ/kg-K	Liquid Phase Mass Fraction Argon	Liquid Phase Mass Fraction CO2	Vapor Phase Mass Fraction Argon	Vapor Phase Mass Fraction CO2	Ar/CO2 Liquid ratio	Ar/CO2 Vapor ratio	Liquid/Vapor ratio	PPMw CO2 Vapor	PPMw CO2 Liquid
0.9900980286	0.009901971	9.902E-01	9901.971	88.79337573	88.79337573	17	17	1390.137921	6.591263705	-115.112962	44.17412761	1.38206718	3.197840573	0.990098029	0.009902	0.999998816	1.18443E-06	99.98999	8.44E+05	0.0001184	1.184433	9901.97
0.9990008991	0.000999101	9.991E-02	999.101	88.71420354	88.71420354	17	17	1387.056573	6.597849899	-115.859475	44.12862839	1.392130962	3.197330119	0.999000899	0.0009991	0.999999873	1.26774E-07	999.8999	7.89E+06	0.0001268	0.126774	999.10
0.9998999910	0.000100009	1.000E-02	100.009	88.7074627	88.7074627	17	17	1386.733926	6.598411307	-115.934207	44.12474664	1.39277148	3.19728655	0.9999	0.0001	0.999999987	1.27688E-08	9998.999	7.83E+07	0.0001277	0.012769	100.00
0.9999899990	1.0001E-05	1.000E-03	10.001	88.72053176	88.72053176	17	17	1386.615638	6.597322666	-115.926316	44.13220245	1.392969803	3.197370607	0.999989999	1E-05	0.999999999	1.28237E-09	99989.99	7.80E+08	0.0001282	0.001282	10.00
0.9999989999	1.0001E-06	1.000E-04	1.000	88.72183717	88.72183717	17	17	1386.603816	6.597213949	-115.925529	44.13294715	1.392985699	3.197379001	0.999999	1E-06	1	1.28292E-10	999899.9	7.79E+09	0.0001283	0.000128	1.00
0.9999999000	1.0001E-07	1.000E-05	0.100	88.72196769	88.72196769	17	17	1386.602634	6.597203079	-115.92545	44.13302161	1.392986897	3.197379841	0.9999999	1E-07	1	1.28298E-11	9998999	7.79E+10	0.0001283	1.28E-05	0.10
0.9999999900	1.0001E-08	1.000E-06	0.010	88.72198074	88.72198074	17	17	1386.602515	6.597201992	-115.925442	44.13302905	1.392986978	3.197379925	0.99999999	1E-08	1	1.28298E-12	99989991	7.79E+11	0.0001283	1.28E-06	0.01