Table 3.1. Equation of State Parameters

Material	ρ_0	C	S	γ_0	k_1	k_2	k_3	e_{00}	e_{01}	e_{02}	e_{03}	e_{04}
1 Aluminum (Al)	2.78	0.53	1.34	2.00	7.906e−01	1.325e+00	2.130e+00	−2.773e−03	−5.547e−03	1.364e−01	2.495e−01	3.160e−01
2 Gold (Au)	19.24	0.31	1.57	2.97	1.797e+00	2.981e+00	4.932e+00	−3.799e−04	−1.128e−03	4.502e−02	9.622e−02	1.355e−01
3 Beryllium (Be)	1.85	0.80	1.12	1.16	1.184e+00	1.975e+00	2.944e+00	−8.303e−03	−9.632e−03	3.143e−01	4.772e−01	5.360e−01
4 Copper (Cu)	8.93	0.39	1.49	1.99	1.386e+00	2.749e+00	5.113e+00	−1.178e−03	−2.344e−03	7.529e−02	1.526e−01	2.190e−01
5 Magnesium (Mg)	1.74	0.45	1.26	1.42	3.511e−01	6.376e−01	1.051e+00	−3.078e−03	−4.371e−03	9.779e−02	1.684e−01	2.107e−01
6 Niobium (Nb)	8.59	0.44	1.21	1.47	1.691e+00	2.839e+00	4.390e+00	−8.054e−04	−1.184e−03	9.761e−02	1.581e−01	1.859e−01
7 Nickel (Ni)	8.87	0.46	1.44	1.93	1.879e+00	3.588e+00	6.430e+00	−1.275e−03	−2.460e−03	1.035e−01	2.014e−01	2.783e−01
8 Lead (Pb)	11.35	0.21	1.46	2.77	4.774e−01	7.329e−01	1.122e+00	−3.612e−04	−1.000e−03	1.965e−02	3.966e−02	5.219e−02
9 Platinum (Pt)	21.42	0.36	1.54	2.40	2.773e+00	5.235e+00	9.556e+00	−3.836e−04	−9.206e−04	6.362e−02	1.324e−01	1.910e−01
10 Steel	7.90	0.46	1.49	2.17	1.648e+00	3.124e+00	5.649e+00	−1.340e−03	−2.908e−03	1.012e−01	2.051e−01	2.901e−01
11 Tantalum (Ta)	16.65	0.34	1.20	1.60	1.941e+00	3.110e+00	4.669e+00	−4.135e−04	−6.617e−04	5.775e−02	9.304e−02	1.703e−01
12 Titanium (Ti)	4.53	0.52	0.77	1.09	1.234e+00	1.220e+00	1.146e+00	−1.562e−03	−1.703e−03	1.353e−01	1.390e−01	1.011e−01
13 Uranium (U)	18.95	0.25	1.56	2.20	1.172e+00	2.368e+00	4.535e+00	−3.144e−04	−6.916e−04	3.017e−02	6.377e−02	9.490e−02
14 Tungsten (W)	19.22	0.40	1.24	1.54	3.121e+00	5.318e+00	8.380e+00	−4.070e−04	−6.268e−04	8.068e−02	1.336e−01	1.604e−01

Synthetics and Compounds

Material	ρ_0	C	S	γ_0	k_1	k_2	k_3
15 Epoxy	1.19	0.27	1.49	0.00	8.869e−02	2.142e−01	4.414e−01
16 Lucite	1.18	0.23	1.82	0.00	6.027e−02	1.968e−01	5.166e−01
17 Polyethylene	0.91	0.29	1.48	0.00	7.653e−02	1.638e−01	3.171e−01
18 Teflon	2.15	0.18	1.71	0.00	7.279e−02	2.275e−01	5.651e−01
19 Quartz	2.20	0.08	1.70	0.00	1.373e−02	4.050e−02	9.803e−02
20 Salt	2.17	0.35	1.34	0.00	2.704e−01	5.084e−01	8.769e−01
21 Water	1.00	0.17	1.92	0.00	2.723e−02	1.045e−01	3.011e−01

1) $\quad P = k_1 x + k_2 x^2 + k_3 x^3 + \gamma_0 E \ [\text{Mbar}]; \quad x = 1 - V; \quad k_2 = 0 \text{ for } x < 0$

2) $\quad T = \dfrac{\frac{E}{\rho_0} - \varepsilon_0}{3R} \ [\text{K}]$

3) $\quad T_\text{m} = T_{\text{m}_0} V^{\frac{2}{3}} \exp\left[2\gamma_0(1 - V)\right] \ [\text{K}]$

4) $\quad \varepsilon_0 = \varepsilon_{00} + \varepsilon_{01} x + \varepsilon_{02} x^2 + \varepsilon_{03} x^3 + \varepsilon_{04} x^4 \ [\text{Mbar} \cdot \text{cm}^3/\text{g}]$

Table 3.2. Parameters for the Steinberg–Guinan constitutive model

	Material	Y^0	Y_{max}	β	n	b	h	T_{m_0}	μ_0
1	Aluminum (Al)	2.900e − 03	6.800e − 03	1.250e + 02	1.000e − 01	8.000e + 00	6.200e − 04	1.220e + 03	2.760e − 01
2	Gold (Au)	2.000e − 04	2.300e − 03	4.900e + 01	3.900e − 01	4.000e + 00	3.200e − 04	1.970e + 03	2.800e − 01
3	Beryllium (Be)	3.300e − 03	1.200e − 02	8.100e + 01	2.200e − 01	2.000e + 00	2.600e − 04	1.820e + 03	1.510e + 00
4	Copper (Cu)	1.200e − 03	6.000e − 03	3.600e + 01	4.500e − 01	3.000e + 00	3.800e − 04	1.790e + 03	4.770e − 01
5	Magnesium (Mg)	1.700e − 03	5.000e − 03	7.000e + 03	1.000e − 01	1.000e + 01	4.800e − 04	1.570e + 03	1.650e − 01
6	Niobium (Nb)	8.000e − 03	1.400e − 02	5.000e + 00	2.000e − 01	1.400e + 00	0.	1.750e + 03	3.770e − 01
7	Nickel (Ni)	1.400e − 03	1.200e − 02	4.600e + 01	5.300e − 01	2.000e + 00	3.400e − 04	1.950e + 03	8.550e − 01
8	Lead (Pb)	8.000e − 05	1.000e − 03	1.100e + 02	5.200e − 01	1.400e + 01	1.200e − 03	2.740e + 03	8.600e − 02
9	Platinum (Pt)	3.000e − 04	3.000e − 03	2.000e + 04	2.000e − 04	3.000e + 00	1.400e − 04	2.870e + 03	6.370e − 01
10	Steel	3.400e − 03	2.000e − 02	4.000e + 01	3.500e − 01	3.000e + 00	4.500e − 04	1.930e + 03	7.700e − 01
11	Tantalum (Ta)	7.700e − 03	1.100e − 02	1.000e + 01	1.000e − 01	2.000e + 00	1.300e − 04	1.740e + 03	6.900e − 01
12	Titanium (Ti)	7.100e − 03	1.500e − 02	7.800e + 02	6.500e − 02	1.000e + 00	6.200e − 04	1.230e + 03	4.340e − 01
13	Uranium (U)	8.000e − 03	1.700e − 02	2.700e + 00	2.600e − 01	1.000e + 00	8.100e − 04	2.420e + 03	8.440e − 01
14	Tungsten (W)	2.200e − 02	4.000e − 02	7.700e + 00	1.300e − 01	1.000e + 00	1.400e − 04	1.670e + 03	1.600e + 00

1) $\quad Y = \left[Y^0(1 + \beta\varepsilon_{eq}^p)^n\right]\left[1 + bPV^{\frac{1}{3}} - h(T - 300)\right]$ [Mbar]

  a) $\quad \left[Y^0(1 + \beta\varepsilon_{eq}^p)^n\right] \leq Y_{max}$

  b) $\quad Y = 0$ for $T > T_m$

2) $\quad \mu = \mu_0\left[1 + bPV^{\frac{1}{3}} - h(T - 300)\right]$ [Mbar]