METALS AND ALLOYS WITH LOW MELTING TEMPERATURE

L. I. Berger

Metal or alloy system	Composition, % * Weight	Atomic	Melting temperature (°C)	Comments	Ref.
Hg	100	100	–38.84		
Cs–K	77.0–23.0	50.0–50.0	–37.5	Eutectic (?)	1
Cs–Na	94.5–5.5	75.0–25.0	–30.0	Eutectic	2
K–Na	76.7–23.3	65.9–34.1	–12.65	Eutectic	3
Na–Rb	8.0–92.0	24.4–75.6	–5	Eutectic	4
Ga–In–Sn	62.5–21.5–16.0	73.6–15.3–11.1	11	Eutectic	5
Ga–Sn–Zn	82.0–12.0–6.0	86.0–7.3–6.7	17	Eutectic	5
Cs	100	100	28.44		
Ga	100	100	29.77		
K–Rb	32.0–68.0	50–50	33	Eutectic	4
Bi–Cd–In–Pb–Sn	44.7–5.3–19.1–22.6–8.3	35.1–8.2–27.3–17.9–11.5	46.7	Eutectic	6
Bi–In–Pb–Sn	49.5–21.3–17.6–11.6	39.2–30.7–14.0–16.2	58.2	Eutectic	6
Bi–In–Sn	32.5–51.0–16.5	21.1–60.1–18.8	60.5	Eutectic	7
K	100	100	63.38		
Bi–Cd–Pb–Sn	50.0–12.5–25.0–12.5	41.5–19.3–21.0–18.2	70	Wood's alloy	6
Bi–In	33.0–67.0	21.3–78.7	72	Eutectic	8
Bi–Cd–Pb	51.6–8.2–40.2	48.1–14.2–37.7	91.5	Eutectic	6
Bi–Pb–Sn	52.5–32.0–15.5	46.8–28.7–24.5	95	Eutectic	6
Na	100	100	97.8		
Bi–Cd–Sn	54.0–20.0–26.0	39.4–27.2–33.4	102.5	Eutectic	6
In–Sn	51.8–48.2	52.6–47.4	119	Eutectic	9
Cd–In	25.3–74.7	25.7–74.3	120	Eutectic	10
Bi–Pb	55.5–44.5	55.3–44.7	124	Eutectic	11
Bi–Sn–Zn	56.0–40.0–4.0	40.2–50.6–9.2	130	Eutectic	6, 7
Bi–Sn	70–30	57.0–43.0	138.5	Eutectic	6, 12
Bi–Cd	60.3–39.7	45.0–55.0	145.5	Eutectic	13, 14
In	100	100	156.6		
Li	100	100	180.5		
Pb–Sn	38.1–61.9	26.1–73.9	183	Eutectic	6,15
Bi–Tl	48.0–52.0	47.5–52.5	185	Eutectic	13
Sn–Zn	91.0–9.0	85.0–15.0	198	Eutectic	14
Sb–Sn	8.0–92.0	7.8–92.2	199	White Metal	16
Au–Pb	14.6–85.4	15.2–84.8	212	Eutectic	17
Ag–Sn	3.5–96.5	3.8–96.2	221	Eutectic	13,18
Bi–Pb–Sb–Sn	48.0–28.5–9.0–14.5	40.8–24.5–13.1–21.6	226	Matrix Alloy	6
Cu–Sn	0.75–99.25	1.3–98.7	227	Eutectic	13, 19
Sn	100	100	231.9		

* The useful expression for correlations between the atomic and weight concentrations of an alloy components are:

$$f\left(\mathrm{a},A_k\right)=\frac{f\left(\mathrm{w},A_k\right)}{M_k\sum_{i=1}^{N}\frac{f\left(\mathrm{w},A_i\right)}{M_i}} \quad \text{and} \quad f\left(\mathrm{w},A_k\right)=\frac{M_k\cdot f\left(\mathrm{a},A_k\right)}{\sum_{i=1}^{N}M_i\cdot f\left(\mathrm{a},A_i\right)} \quad (i=1,\ldots,k,\ldots,N)$$

where $f(\mathrm{a}, A_i)$ and $f(\mathrm{w}, A_i)$ are the atomic and weight concentrations of component A_i, respectively, and M_i is the atomic weight of this component.

References

1. Zintle, E. and Hauke, W., *Z. Electrochem*., 44, 104, 1938.
2. Rinck, E., *Compt. Rend*., 199, 1217, 1934.
3. Krier, C. A., Craign, R. S., and Wallace, W. E., *J. Phys. Chem*., 61, 522, 1957.
4. Goria, C., *Gazz. Chim. Ital*., 65, 865, 1935.
5. Baker, H., Ed., *ASM Handbook, Volume 3: Alloy Phase Diagrams*, ASM Intl., Materials Park, OH, 1992.
6. Sedlacek, V., *Non–Ferrous Metals and Alloys*, Elsevier, 1986.
7. Villars, P., Prince, A., Okamoto, H., Eds., *Handbook of Ternary Alloy Phase Diagrams*, ASM Intl., 1994.
8. Palatnik, L. S., Kosevich, V. M., and Tyrina, L. V., *Phys. Metals Metallog. (USSR)*, 11, 75, 1961.
9. Neumann, T. and Alpout, O., *J. Less–Common Metals*, 6, 108, 1964.
10. Neumann, T. and Predel, B., *Z. Metallk*., 50, 309, 1959.
11. Roy, P., Orr, R. L., and Hultgren, R., *J. Phys. Chem*., 64, 1034, 1960.
12. Dobovicek, B. and Smajic, N., *Rudarsko–Met. Zbornik*, 4, 353, 1962.
13. Massalski, T. B., Okamoto, H., Subramanian, P. R., and Kacprzak, L., Eds., *Binary Alloy Phase Diagrams*, 2nd ed., ASM Intl., 1990.
14. Dobovicek, B. and Straus, B., *Rudarsko–Met. Zbornik*, 3, 273, 1960.
15. Schurmann, E. and Gilhaus, F. J., *Arch. Eisenhuettenw*., 32, 867, 1961.
16. Rosenblatt, G. M. and Birchenall, C. E., *Trans. AIME*, 224, 481, 1962.
17. Evans, D. S. and Prince, A., in *Alloy Phase Diagrams*, MRS Simposia Proc., Vol. 19, North–Holland, 1983, p. 383.
18. Umanskiy, M. M., *Zh. Fiz. Khim*., 14, 846, 1940.
19. Homer, C. E. and Plummer, H., *J. Inst. Met*., 64, 169, 1939.