

a factor of 5) gives an appreciably bigger pressure dependence for ρ_i . The initial pressure coefficients for the specimens of different purity are not too different but the difference appears to increase with pressure. Since the departures from Matthiessen's rule are probably mainly due to different anisotropies of $\tau(k)$ for phonon and impurity scattering, one can only assume that these are changing

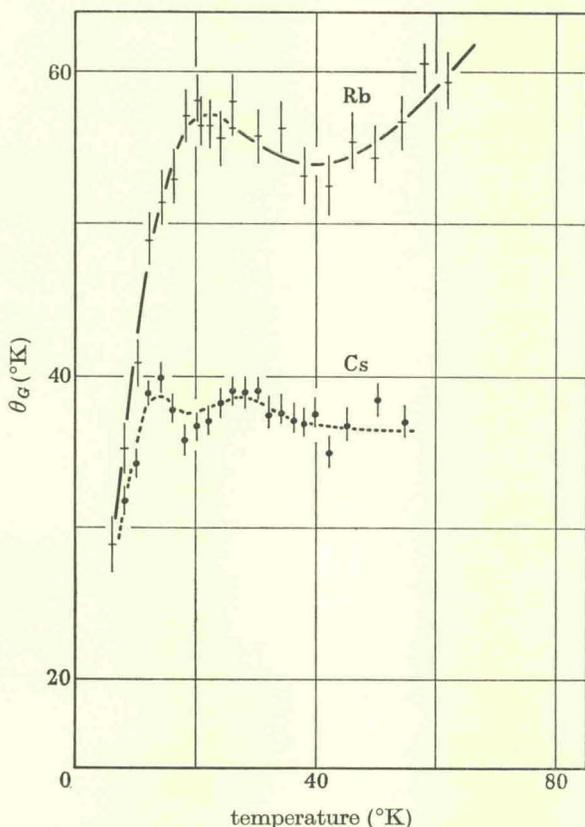


FIGURE 3. Values of θ_G as a function of temperature for rubidium and caesium. θ_G is obtained by comparing the ideal resistivity of the metal with that predicted by the Bloch-Grüneisen relation.

differently in the two sets of specimens. This does, however, show that in this region the pressure coefficients are as yet not very reliable. At higher temperatures, the results from specimens of different purity agree well (cf. the results on rubidium specimens 1, 3 and 5 near 20 °K).

3.3.1. The minimum in the R - p curve for caesium

Bridgman (1925) found that the resistance versus pressure curve of caesium went through a minimum (cf. figure 7); at 0 °C this minimum occurs at a pressure of about 4000 atm. Since our measurements extend only to 3000 atm, we do not observe this minimum, but we can make some deductions from our results about its temperature dependence.

Figure 2 shows that at three different densities the ideal resistivity of caesium is directly proportional to the absolute temperature down to quite low temperatures. It is reasonable to suppose that this would also be true at the slightly higher densities corresponding to and beyond that at which the minimum occurs. If this were so then the minimum would be associated with one particular density at all temperatures, at least in the region where the ideal resistivity (at fixed density) is directly proportional to T . This enables us to estimate how the pressure at which the minimum occurs changes with temperature.

TABLE 9. THE PRESSURE DEPENDENCE OF THE ELECTRICAL RESISTANCE OF RUBIDIUM

The listed values give $R_i(p)/R_i(p=0)$.

pressure (atm)	4.2 °K {Rb 1, 3}	4.2 °K {Rb 5}	12.3 °K {Rb 1}	14.3 °K {Rb 1}	20.3 °K {Rb 1}	20.3 °K {Rb 3}	20.7 °K {Rb 5}
0	1.00	1.00	1.00	1.00 ₀	1.00 ₀	1.00 ₀	1.00 ₀
250	—	—	0.95	0.95 ₀	0.95 ₀	0.96 ₀	0.95 ₀
500	0.92	0.90	0.92	0.92 ₀	0.92 ₂	0.92 ₂	0.92 ₃
750	—	—	0.88	0.88 ₂	0.88 ₆	0.88 ₅	0.88 ₇
1000	0.85	0.81	—	—	0.85 ₃	0.85 ₁	0.85 ₄
1250	—	—	—	—	0.82 ₀	0.82 ₀	0.82 ₁
1500	0.80	0.69	—	—	0.79 ₀	0.79 ₀	0.79 ₁
2000	0.72	0.59	—	—	—	—	—
2500	—	—	—	—	—	—	—
	29.5 °K {Rb 1}	55.9 °K {Rb 1}	67.9 °K {Rb 1}	78.4 °K {Rb 1}	78.8 °K {Rb 5}	79.5 °K {Rb 3}	90.7 °K {Rb 1}
0	1.00 ₀	1.00 ₀	1.00 ₀	1.00 ₀	1.00 ₀	1.00 ₀	1.00 ₀
500	0.92 ₃	0.907	0.93 ₀	0.92 ₉	0.92 ₉	0.92 ₉	0.92 ₈
1000	0.85 ₈	0.86 ₈	0.86 ₇	0.86 ₄	0.86 ₆	0.86 ₄	0.86 ₄
1500	0.79 ₉	0.80 ₈	0.81 ₁	0.80 ₈	0.81 ₂	0.80 ₈	0.80 ₈
2000	0.74 ₄	0.75 ₈	0.76 ₀	0.75 ₈	0.76 ₁	0.75 ₉	0.75 ₈
2500	0.70 ₁	0.71 ₁	0.71 ₅	0.71 ₃	0.71 ₈	0.71 ₅	0.71 ₄
	113.2 °K {Rb 1}	160.5 °K {Rb 1}	195.0 °K {Rb 1}	195.3 °K {Rb 3}	230.9 °K {Rb 1}	273.2 °K {Rb 2}	273.2 °K {*}
0	1.00 ₀	1.00 ₀	1.00 ₀	1.00 ₀	1.00 ₀	1.00 ₀	1.00 ₀
500	0.92 ₃	0.92 ₅	0.92 ₃	0.94 ₅	0.91 ₆	0.91 ₁	—
1000	0.85 ₉	0.85 ₈	0.85 ₉	0.87 ₄	0.84 ₄	0.83 ₈	0.85 ₄
1500	0.80 ₂	0.80 ₀	0.80 ₂	0.81 ₄	0.78 ₂	0.77 ₇	—
2000	0.75 ₂	0.74 ₉	0.75 ₀	0.76 ₁	0.72 ₉	0.72 ₅	0.73 ₉
2500	0.70 ₇	0.70 ₅	0.70 ₅	0.71 ₆	0.68 ₄	0.67 ₆	—

* P. W. Bridgman.

On the basis of our assumptions about the equation of state of caesium we estimate that the pressure required to keep the density of the metal constant increases by about 2.5 atm/degC around room temperature. So we would expect the pressure of the minimum to change by a similar amount. Between 0 and 100 °C Bridgman (1925) has measured this pressure directly. If we take into account only his reproducible measurements on bare wires and ignore his data on capillary specimens or the values which were quite different with increasing and