



FIG. 1. P-T phase diagrams of Li, Na, K, Rb, and Cs. The fusion curves were obtained by the DTA method in [27]. The points on the ordinate in the Li and Na diagrams represent the polymorphic transition temperatures,<sup>[29]</sup> and the "stars" in all the diagrams represent the coordinates of the polymorphic transitions, found from electrical resistance discontinuities.<sup>[28]</sup> The upper fusion curve of Rb and a part of the phase boundary between RbI and RbII, shown by continuous lines, were obtained from electrical resistance discontinuities.<sup>[30]</sup> The Cs diagram up to 60 kbar was obtained by the DTA method<sup>[23]</sup> and the polymorphic transitions at 175 kbar were found from electrical resistance discontinuities.<sup>[24]</sup> In these and later diagrams, the hypothetical phase boundaries are shown dashed.

morphism of elements in the periodic system using the available information.

## 2. ALKALI METALS OF GROUP I-A

Normally, all alkali metals have the bcc lattice of type A2,\* with a packing factor (which is the ratio of the volume occupied by atoms to the total volume of a cell)  $\varphi = 0.68$ . When cooled under pressure, the crystal structure of these metals changes. This can be seen clearly in their P-T phase diagrams, which are shown in Fig. 1.

In the pressure range up to 60 kbar<sup>†</sup>, the most well defined among the P-T diagrams is that of cesium. While investigating the specific volume of cesium and

its electrical resistance as a function of pressure, Bridgman established the existence of two polymorphic transitions, at 23 and 45 kbar.<sup>[20,21]</sup> Particularly important were the results found for the transition at 45 kbar, because this transition was accompanied by a surprisingly large discontinuity in the volume (12%) and a change in the electrical resistance of an unusual type—the curve had a peak. Consequently, cesium has become the subject of a host of investigations; it was recently shown that the pressure dependence of the electrical resistance of cesium was more likely to be a sharp peak with a small plateau at its apex.<sup>[22]</sup>

Figure 2 shows this dependence, together with the curve found by Bridgman. This form of pressure dependence suggested that another modification of cesium, Cs III, existed over a very narrow range of pressures (0.5 kbar only).

The P-T phase diagram of cesium was determined to 60 kbar and showed boundaries between the regions of stability of three modifications: Cs I, Cs II, and

\*Here and later, we shall use the structure notation proposed in "Strukturbericht." A2 is a bcc cube of the tungsten type.

<sup>†</sup>1 bar =  $10^6$  dyn/cm<sup>2</sup> = 1.0197 kg/cm<sup>2</sup> = 0.98692 normal atmospheres.