



FIG. 2. Angular dependence of the oscillation period of the susceptibility of zinc caused by: a) the smallest group of mobile charges (1 – first, 2 – second orientation of the crystal); b) the group which determines one of the high frequency components (fine structure) of the de Haas – van Alphen effect (curves 3, 4, and 5 refer to the first, second and third orientation of the crystal, respectively), and the group which determines the hyperfine structure of the effect (curves 6 and 7 refer to the first and second orientation of the crystal, respectively).  $\theta$  = angle between vector  $H$  and principal crystal axis;  $\varphi$  = angle between vector  $H$  and the diagonal crystal axis in the basal plane.  $\times$ ,  $\circ$  – two fine-structure branches observed on the experimental  $\Delta\chi(1/H)$  curves at the large angles  $\theta$ .

recrystallized seven times. A rather detailed study of Zn-1 was made in one of the preceding papers.<sup>12</sup> The crystal Zn-7, with the hexagonal axis along the geometric axis of the sample, was prepared by Kapitza's method on a plate subjected to a temperature gradient at a growth rate of 5 mm/hr. The

maximum sample diameter was 4 mm.

A widely-used method for the qualitative estimate of crystal strain is the microscopic investigation of slip along the basal plane.<sup>13</sup> The microscopic investigation of slip in crystals Zn-1, Zn-2, Zn-3, Zn-4, and Zn-7 showed that Zn-7 was the least strained and Zn-4 the most strained.

The crystals were oriented by means of an optical double-arc goniometer.<sup>12</sup> Three orientations of the zinc crystals were investigated: (1) The diagonal axis of the crystal was taken parallel to the axis of suspension – the first orientation. (2) The direction perpendicular to the diagonal axis and lying in the basal plane was taken parallel to the axis of suspension – the second orientation. (3) The principal axis of the crystal was taken parallel to the axis of suspension – the third orientation.

#### 4. RESULTS OF THE MEASUREMENTS

##### a. The de Haas – van Alphen Effect in Unconstrained Zinc Crystals

It is known that the experimental curves  $\Delta\chi(1/H)$  for Zn crystals represent the superposition of three frequency components of the variation of the susceptibility with the field.<sup>12</sup> Each of these frequency components is caused by a certain group of charge carriers in the metal; the component with the longest period is caused by the smallest group of charge carriers. The high frequency components are usually called the fine and the hyperfine structure of the de Haas – van Alphen effect. Before investigating the effect of homogeneous compression on the de Haas – van

FIG. 3. Variation with  $1/H$  of the torque  $L_z/H^2$ , acting on the crystal in its third orientation in the field, at a temperature of  $T = 4.2^\circ\text{K}$ . Crystal Zn-1: a –  $\varphi = 2^\circ$ ; b –  $\varphi = 4.5^\circ$ ; c –  $\varphi = 7^\circ$ ; d –  $\varphi = 9.7^\circ$ ; e –  $\varphi = 15^\circ$ ; f –  $\varphi = 18^\circ$ ; g –  $\varphi = 22^\circ$ ; h –  $\varphi = 26^\circ$ ; i –  $\varphi = 28^\circ$ .

