resistance of a metal with a warped Fermi surface obtained by Olson and Rodriguez show that this property is quite sensitive to the shape of the surface. Unfortunately the size of the magnetoresistance effect depends on the square of the mobility and becomes extremely small at room temperature. Measurements by Kapitza[8] on sodium and lithium using pulsed magnetic fields of 300 kgauss at room temperature showed resistance changes of less than 2%; since the effect goes as the square of the magnetic field ordinary dc magnetic fields of 10 kgauss would produce resistance changes of 0.002%, too small to be useful.

The Hall effect is another transport property that can be studied. The Hall constant, R, is defined by

$$E=RJH, \tag{2}$$

where E is the electric field in the y direction produced in a sample in which a current of density J flows along the x direction and which is subject to a magnetic field H along the z direction. The Hall constant, in units of (volt-cm)/(ampere-gauss), may be written as

$$R=1/Necn^*, \tag{3}$$

where c is the velocity of light in cm/sec and n^*, which we shall refer to as electrons/atom, is a factor which is unity if the expression for R is derived for the case of free electrons or for any spherical Fermi surface. More accurate treatments of the Hall effect involve solving the Boltzmann transport equation for specific forms of the energy, $E(\mathbf{k})$, and the scattering time $\tau(\mathbf{k})$. The Hall constant is then given as the quotient of two integrals involving the scattering time and energy derivatives taken over the Fermi surface[9]; n^* is then obtained as a factor which depends only on the anisotropy of $\tau(\mathbf{k})$ and $E(\mathbf{k})$, and is independent of the magnitude of τ.

Cooper and Raimes have carried out such a calculation for the case of anisotropic scattering times and warped Fermi surfaces that are described by Kubic harmonics.[10,11] They express the length of the wave vector of an electron on the Fermi surface as:

$$k=k_0[1+AY_4(\theta,\phi)+A_1Y_6(\theta,\phi)]. \tag{4}$$

Similarly they write

$$\left(\frac{\partial k}{\partial E}\right)_{E=E_f}=k_0'[1+BY_4(\theta,\phi)+B_1Y_6(\theta,\phi)]; \tag{5}$$

the derivative is taken at the Fermi energy E_f. The scattering time is also expanded in Kubic harmonics;

$$\tau=\tau[1+CY_4(\theta,\phi)+C_1Y_6(\theta,\phi)]. \tag{6}$$

The Kubic harmonics $Y_4(\theta,\phi)$ and $Y_6(\theta,\phi)$ are combinations of spherical harmonics having cubic symmetry; they are given by[12]

$$Y_4(\theta,\phi)=5/2(x^4+y^4+z^4-3/5),$$

and

$$Y_6(\theta,\phi)=231/2(x^2y^2z^2-Y_4(\theta,\phi)/55-1/10\ldots$$

where $x=\sin\theta\cos\phi$, $y=\sin\theta\sin\phi$ and $z=\cos\theta$. principal directions the values of the Kubic ha… are:

$$Y_4(100)=1,\quad Y_4(110)=1/4,\quad Y_4(111)=\ldots$$

$$Y_6(100)=1,\quad Y_6(110)=-13/8,\quad Y_6(111)=1\ldots$$

By evaluating the expression for the Hall consta… the above forms for the scattering time and the … energy surfaces Cooper and Raimes obtain an … sion for n^*;

$$n^*=1+4/21[9A^2-18A(C-B)-(C-B)^2]$$
$$+8/13[20A_1^2-40A_1(C_1-B_1)-(C_1-B_1)^2\ldots$$

As expected, n^* is unity for sperical surfaces a… tropic scattering times.

Except for the direct volume dependence of … pressure dependence of R comes from n^*. Cha… n^* reflect changes in the anisotropy of the Fermi … and/or the anisotropy of the scattering time. If … urement of the pressure dependence of the Hall c… is performed in the impurity scattering range … the anisotropy of the scattering time is directly … only to the anisotropy of the Fermi surface, the … of the measurement can be interpreted in te… changes of the anisotropy of the Fermi surfac… in a room temperature measurement lattice s… is dominant and the possibility of anisotropy … scattering time arising from the elastic aniso… the crystal must be considered.

In addition to sensitivity of the Hall effe… anisotropy of the Fermi surface and of the s… time there are some experimental advantages … measurement. It can be performed at room … ture, single crystal samples are not necessary, a… the scattering is dominated by the lattice small … of impurities are not important.

EXPERIMENTAL[13]

The electrical measurements were perform… dc system using a Rubicon No. 2767 μv po… with a galvanometer amplifier as a detect… vanometer amplifier employed a simple op… to focus the light reflected by the mirror of … galvanometer onto two selenium photocells … connected so that their voltages opposed … of the pair fed a secondary galvanomet… vanometer amplifier had a sensitivity of …

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