heuristic Fermi energy adjustment. For $(m^*/m) < 1$ the situation is less clear. In this case, for the orbits σ and α the experimental results are consistent with the NFE volume dependence of the Fermi energy. For the orbit β, on the other hand, closer (though still poor) agreement is found with the NFE energy dependence when $\boldsymbol{H}$ is along $\langle 11\bar{2}0\rangle$, and with the heuristic energy modification for $\boldsymbol{H}$ along $\langle 10\bar{1}0\rangle$. On the basis of these observations it appears that some correlation exists between the effective mass characterizing a given orbit and the Fermi energy modification required to account for the experimental results. The meaning of this correlation, if any, is not clear.

Table 1

Experimental and calculated results for the logarithmic stress derivative, d ln $A/\mathrm{d}\sigma$, of the various orbits studied

orbit	direction of H	logarithmic stress derivatives, d ln $A/\mathrm{d}\sigma$				effective mass[a]) m^*/m
		experimental	NFE-type ΔE_F	modified ΔE_F	units $(\mathrm{dyn/cm^2})^{-1}$	
ζ	$\langle 10\bar{1}0\rangle$	9.0 ± 0.9	4.28	see text	10^{-12}	1.3
β	$\langle 11\bar{2}0\rangle$	-0.46 ± 0.62	-0.91	-2.65	10^{-10}	0.1
β	$\langle 10\bar{1}0\rangle$	-2.3 ± 0.6	-0.542	-1.82	10^{-10}	0.1
σ	$\langle 11\bar{2}0\rangle$	2.2 ± 0.9	1.98	-2.47	10^{-11}	0.5
λ	$\langle 10\bar{1}0\rangle$	9.9 ± 3.1	4.38	9.92	10^{-12}	1.1
α	$\langle 0001\rangle$	1.0 ± 0.6	1.11	4.60	10^{-9}	0.01

[a]) After J. J. Sabo, Jr. [20]. (Sabo's values have been rounded off for presentation here.)

5. Summary and Conclusions

The effect of uniaxial stress on the extremal areas of various segments of the zinc Fermi surface have been measured by determining the shift in phase of ultrasonic quantum oscillations of the attenuation, as the stress was applied. The expected area changes with stress were calculated for the same orbits, using a non-local pseudopotential model for the Fermi surface.

The dependence of the Fermi energy on the strain was included in the calculation in two different ways. In one approach (referred to as NFE-OPW) it was assumed that the Fermi energy had the same volume dependence as that given by the NFE model. In the other method (referred to as M-OPW), the change in the Fermi energy was chosen to fit the data on one orbit (the lens) whose measured area change differed by about a factor of two from the prediction based on the first approach. The area changes for all the other orbits were calculated separately using both the NFE and heuristic Fermi energy dependence.

The results of the measurements and calculations are presented in Table 1. For any one orbit there is reasonable numerical agreement between experiment and theory, while the largest and smallest stress derivatives differ by a factor of around 100. This indicates very good overall agreement between the predictions of the theory used and the experimental results. The one orbit, i.e., the needles, for which the present experimental results can be directly compared with the results of other experiments, gives good agreement both with the other experiments and with the NFE-OPW model.

A correlation seems to exist between the effective mass characterizing a given orbit and the type of volume dependence of the Fermi energy needed to achieve agreement between experimental and calculated results.

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