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Changes in the Fermi surfaces of zinc and cadmium subjected to uniaxial compression

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Abstract. The changes produced by uniaxial compression in the Fermi surfaces of zinc and cadmium have been measured using a new device for applying the compressive stress. The de Haas–van Alphen effect was used to determine the changes in the smaller extremal orbits, four in zinc and three in cadmium. Where comparison is possible, satisfactory agreement is obtained with other work. One orbit in zinc, whose position on the Fermi surface was formerly uncertain, is more reliably identified from the results.

1. Introduction

During the past few years there have been reported a number of experiments on the changes produced in the Fermi surfaces of metals which have been elastically stressed. In the majority of experiments the changes in Fermi surface have been determined from measurements on quantum oscillations (particularly the de Haas–van Alphen effect) in crystals which have been subjected to pressure or uniaxial stress.

Metals which have been studied under pressure are: potassium, rubidium, caesium (Glinski and Templeton 1969); copper, silver, gold (Templeton 1966, Schirber and O'Sullivan 1970b): beryllium (Schirber and O'Sullivan 1969a); zinc (Balain *et al* 1960, O'Sullivan and Schirber 1966); cadmium (Schirber and O'Sullivan 1968); aluminium (Meltz 1966); lead (Anderson *et al* 1967a); indium (O'Sullivan *et al* 1967 and 1968); tin (Perz *et al* 1969); thallium (Anderson *et al* 1970); graphite (Anderson *et al* 1967b); antimony (Schirber and O'Sullivan 1969b, Tay and Priestley 1970); bismuth (Itskevich and Fisher 1968, Schirber and O'Sullivan 1970a); tungsten (Schirber 1971); zirconium (Schirber 1970).

Metals which have been studied under uniaxial stress are: copper, silver, gold (Shoenberg and Watts 1967); gold (Gamble and Watts 1972); tin (Perz and Hum 1971); bismuth (Brandt and Ryabenko 1960, Bate and Einspruch 1965).

The effect of uniaxial stress has been deduced in a number of metals by combining measurements of the amplitude of de Haas–van Alphen oscillations with measurements of the amplitude of the equivalent oscillations in the magnetostriction. Metals studied in this way have been: copper, silver, gold (Slavin 1972); beryllium (Chandrasekhar *et al* 1967); zinc (Griessen and Kundig 1972, Reitz and Sparlin 1972); aluminium (Griessen and Sorbello 1972); bismuth (Aron and Chandrasekhar 1969).

Measurements of the velocity of sound have also yielded results for the pressure dependence of the Fermi surface of beryllium (Testardi and Condon 1970).