CHAPTER I

INTRODUCTION

The Hall effect is the name of the phenomenon that when a transverse magnetic field is applied to a specimen carrying an electric current, a voltage is developed across the sides of the specimen such that it sets up in the specimen an electric field perpendicular to both the current and the magnetic field. It is discovered by E.H. Hall in 1879 during a study of the force acting on a conductor carrying a current in a magnetic field.(1).

The study of Hall effect is important in the understanding of transport phenomena in solids and, together with a measurement of the conductivity, it sheds light on the conduction mechanisms. For instance, it is the only experiment that provides simple, and convincing evidence supporting the postulate of positive current carriers or holes in many solids. It also supplies information on the band structure of many materials.

Because of the special band structure of bismuth, the Hall coefficient of bismuth is anomalously large. The Hall voltage is inversely proportional to the sample thickness. When made into thin films, the Hall voltage of bismuth films is so large as to be easily measurable by sensitive voltmeters. This makes it possible to utilize the Hall effect for practical applications. Thin bismuth films can be made into probes for measuring magnetic fields. Hall probes have the advantage of being very small and thin and there is no need for rotation or other motion as necessary in search coils.

Bismuth has a fairly large value of conductivity, so that it can almost be classified as a metal. The analysis of the Hall effect can thus be made in the crude and simple 'Electron Gas Model'.

It is experimentally convenient to deal with bismuth films since this metal is easily evaporated and the films may be kept for long periods without appreciable oxidation.

The film shape sample also has the advantage of being able to carry a much higher current density without overheating than the bulk material.