CHAPTER I

INTRODUCTION

The history of man's interest in magnetism goes back many centuries, but his understanding of this subject is recent and still incomplete. Practically all naturally occurring magnetic minerals contain the element iron, and until this century all synthetic magnetic materials contained at least one of the ferromagnetic transition metal elements iron, cobalt or nickel. However, chromium and manganese, the two elements preceding iron in the periodic table, are found to have magnetic moments in certain alloys. Interest in these alloys commenced in 1898 with the discovery by Heusler that an alloy containing copper, manganese, and aluminum was strongly attracted to a hand magnet.(1) The ferromagnetic constituent of that alloy was found to have a stoichiometric composition of Cu_2MnAl. Since that time, investigators have found that the aluminum can be replaced by tin, gallium, indium, arsenic or antimony and still have the alloy attracted to a magnet. This group of alloys is appropriately named Heusler alloys. This discovery, due to its important bearing on the general theories of magnetism, excited considerable interest and prompted numerous further investigations resulting in the discovery

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(1) Bozorth, R., Ferromagnetism, D. VanNostrand, New York 1951

of many more ferromagnetic alloys and compounds of non-ferromagnetic elements. Interest in the Heusler alloys, however, persists, since it has been established that they are ternary intermetallic compounds with magnetic properties that can be altered by changing the degree or type of chemical order.

The aim of the present experiment is to investigate an intermetallic compound with a chemical formula given by Ni_2MnGe. The alloy is reported to assume the Heusler structure. The present investigation includes methods of preparation, effects of heat treatment and magnetic structure study by neutron diffraction technique.