MAGNETIC STUDY OF THE ALLOY
SYSTEM CuAl$^{1-x}$Fe$^x$

BY

REZQ JABER REZQ AL-JABER

Bachelor Degree in Science (Physics), 1987.
Thesis submitted in partial fulfillment of the
requirements for the degree of M.Sc. in Physics
at Yarmouk University.

Professor Ahmad S. Saleh
Advisor & Chairman.

Dr. Sami Mahmood.
Member.

Dr. Ibrahim Abu-Aljarayesh.
Member.

March, 1990.
ABSTRACT

In this thesis we have made a study of the magnetic properties for the alloy system CuAl_{1-x}Fe_x with the values of x = 0.05, 0.10, 0.20, 0.30 and 0.40. The study was carried out using a Faraday Balance, and a low temperature cryostat. The magnetization measurements were done over a temperature range from 60 K to 490 K and in magnetic fields of up to 1.6 T. Magnetization isotherms were obtained for all alloy samples.

The results of this study are analyzed within the framework of the existing theories of magnetic properties and magnetic order. These results show that a gradual change occurs in the magnetic phases in these alloys. For the alloys with low x values (x=0.05 and 0.10) there is evidence for the existence of a diamagnetic phase coupled with a very weak ferromagnetic phase which may be associated with some iron precipitates. In the alloy with x=0.20 a weak paramagnetic phase develops, which becomes strong and dominant in the alloy with x = 0.30. A superparamagnetic phase is clearly observable in the alloy with x=0.40, and the size of the magnetic particles in this alloy was estimated to be \( \approx 36\mu \) in radius, and the average magnetic moment per particle was estimated to be \( \approx 1300\mu_B \).