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# ATOMIC MIGRATION AND SUPEREXCHANGE INTERACTION IN $CoCr_{0.1}Fe_{1.9}O_4$

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## Introduction

A ferrimagnetic spinel can be represented by the formula $AB_2O_4$, the A-B magnetic interactions between the magnetic atoms on the *A* (tetrahedral) site and the *B* (octahedral) sites are stronger than *A*-*A* interactions and *B*-*B* interactions [1]. The metallic atoms are in an inverse distribution; half the atoms of iron are in the *A* sites and the other half plus magnetic atoms in the *B* sites. However, $CoFe_2O_4$ is not completely inverse, and the degree of inversion depends on the heat treatment. The area ratio, Fe(*A*)/Fe(*B*), has been found to vary from 0.61 $\pm$0.04 to 0.87 $\pm$0.04 for two extremely quenched and slowly cooled $CoFe_2O_4$ samples, respectively [2,3]. $CoCr_2O_4$ is a normal spinel with a Néel temperature of 100 K [4]. In this article, we present our Mössbauer and x-ray results on a slowly cooled $CoCr_{0.1}Fe_{1.9}O_4$ with a special emphasis on the atomic migration as a function of temperature and the Debye temperatures for *A* and *B* sites.