

## PREFACE

A composite material may be well suited for a particular application than the original materials. In the modern and constantly developing technological scenario the existing materials cannot meet the industry requirements. Recently, the interest has been shifted to exploit metallic or ceramic matrix composites for electrical applications. A new class of physical properties of composite materials is that of "product properties" in which the phases or sub-materials of the composites are selected in such a way that an effect in one of the phases leads to a second effect in the other phase. Following the concept of product property as suggested by Van Suchtelen a suitable combination of ferrite and ferroelectric can give rise to magnetoelectric effect. The composites exhibiting magnetoelectric effect (ME effect) are termed as magnetoelectric composites. One of the most important scientific applications of magnetoelectric composites resides in the fact that they give precious information for determining the magnetic point groups and magnetic space groups.

Taking into consideration the high value of ME conversion factor and other applications of  $\text{Ni}_{0.9}\text{Co}_{0.1}\text{Fe}_2\text{O}_4$  -PZT composites with  $\text{Ni}_{0.9}\text{Co}_{0.1}\text{Fe}_2\text{O}_4$  as magnetostrictive phase, the present work on the studies of electrical properties of  $\text{Ni}_{0.75}\text{Co}_{0.25}\text{Fe}_2\text{O}_4 - \text{Ba}_{0.8}\text{Pb}_{0.2}\text{TiO}_3$  composites was undertaken.

The subject matter of the present work is divided into six chapters. The chapter-I is introduction to composite materials. It deals with definition and classification, need and advantages, magnetoelectric composites, literature survey and orientation of the problem.

The chapter II is divided into two sections which cover historical development, crystal structure, classification, theories and applications of ferrite and ferroelectrics.

Chapter III is subdivided into two parts, which cover, preparation of ferrite -ferroelectric composites and characterization of the samples by using

X-ray diffraction.

Fourth chapter covers the studies on electrical properties namely, dielectric behaviour, ac and dc resistivity and thermoelectric power.

Chapter V deals with the magnetoelectric effect.

Summary and Conclusions are given in the sixth chapter. References are listed at the end of each chapter.

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