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Chapter-9

Structure-Property relation in Aurivillius Type Materials and Their Applications

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Abstract

The Aurivillius type layered structure bismuth oxide ceramic material $SrBi_2V_2O_9$ (SBV) was prepared through the solid-state reaction method. The X-ray diffraction data reveals the orthorhombic crystal structure. Temperature-dependent electrical parameters were measured over a wide range of frequencies and temperatures using an impedance analyser. The impedance properties occur in the sample due to the presence of bulk and grain boundary effects. The material exhibits the negative temperature coefficient of resistance (NTCR) behaviour like a semiconductor. The ac conductivity data of the sample obeys Jonscher's universal power law as well as the Arrhenius equation.

Keywords: Aurivillius type materials, Solid-state reaction method, XRD, Complex Impedance, and Conductivity.

9.1. Introduction

The solid or crystal consists of a large number of atoms that are arranged regularly. The physical properties of solids (such as electrical, mechanical, magnetic, dielectric, and ferroelectric, etc.) are greatly affected by the arrangement of atoms or crystal structure of materials. Properties change with crystal structure known as structure-property relation. There are different families of materials such as Perovskite-type, Tungsten-Bronze type, Aurivillious type, Pyrochlore-type, etc, which may alter the various physical properties. Among the different kind of materials, the Aurivillious materials have been proved to show many peculiar properties which make them ready for device applications.

The Aurivillius structure is the family of layered bismuth oxides ceramics which was first was first reported by Aurivillius **[1].** The general formula for Aurivillius family of layered oxide is $(Bi_2O_2)^{2+}$ $(A_{m-1}B_mO_{3m+1})^{2+}$ where A is a mono/di/trivalent ion (metals or nonmetals or some