

## A review on electrical property of BaTiO<sub>3</sub>

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### Abstract

BaTiO<sub>3</sub> is a ferroelectric material having perovskite structure. It is the first ferroelectric material having perovskite structure. It has important functional properties, so it can be used in various devices. BaTiO<sub>3</sub> is a lead-free piezoelectric material so it is eco-friendly. The BTO has wider field of applications. The properties of this material can be enhanced by doping with suitable dopants. Using different methods of synthesis the grain size can be changed and hence the properties also enhanced.

**Keywords:** BTO, Perovskites, Ferroelectric.

### Introduction

Ferroelectrics or ferroelectric materials belong to a group of materials which have spontaneous polarization even in the absence of the applied electric field. In this type of materials the direction of polarization can be reversed which results in the formation of hysteresis loop. The materials having ferroelectric property attracted the scientist community because of their wide applications. The ferroelectric materials have wide range of applications. BaTiO<sub>3</sub> is a ferroelectric material having perovskite structure. It is the first ferroelectric material having perovskite structure. It has important functional properties, so it can be used in various devices [1]. BaTiO<sub>3</sub> is a lead-free piezoelectric material so it is eco-friendly [2,5]. The BTO has wider field of applications. It has applications in devices like sonar, actuator etc. But the electrical properties of pure phase BaTiO<sub>3</sub> are weak as compared to other lead-based materials [9]. The dielectric constant of the materials should be large if it is used in capacitors. Also the size of grain has impact on the properties of the sample [3]. The crystal structure of BTO undergoes transition as temperature changes. It changes from cubic to tetragonal phase due to change in temperature. Then the tetragonal structure changes to orthorhombic structure. At last the rhombohedral phase is obtained by further decrease in temperature. The cubic structure of barium titanate does not have spontaneous dipole. So this phase is paraelectric. The cooling enhance the dipole moment so other phases are ferroelectrics [4]. There is presence of ferroelectric, piezoelectric, pyroelectric properties and also high dielectric permittivity in lead free Barium titanate-based composites. The temperature coefficient of resistivity is also positive. Due to the above said properties the bulk ceramics and thick films applied in multilayer ceramic capacitors. Also in posistors, piezoelectric and ultrasonic actuators it is used. It is applied tunable elements in microwave circuits for telecommunication [6]. The properties of this material