CHAPTER 1

INTRODUCTION

1.1 BACKGROUND RESEARCH

Today, lead zirconate titanate powder (PZT) are the utmost generally utilized for different modern operations because of their astounding piezoelectric properties. Ultimately, it is surely understood that PZT ceramics are environmentally burdened materials since it produces toxic PbO during sintered with high temperature. In this way, the examination focused on how to supplant PZT with another material that lead-free piezoelectric ceramics. They concentrated on this matter as the results of natural issues emerging from the lead poisonous quality. Among the free lead piezoelectric ceramics production, Bi$_{0.5}$Na$_{0.5}$TiO$_3$ or BNT is expected to replace PZT due the developing worry with ecological contamination (Wu et al., 2011)

BNT is one of a perovskite structure that displays high Curie temperature ($T_c =$ 320 °C) furthermore solid ferroelectric impact with a broadly comprehensive polarization ($P_r =$ 38 $\mu$C/cm$^2$) at room temperature. For some reason, a sol-gel technique used to get ready BNT-BT creation. Sol-gel is a strategy for delivering strong materials from little particles. The technique is utilized for the manufacture of metal oxides. It experiences the drawbacks of chemical inhomogeneity prominent to particle size for the component. Sol-gel technique has favorable circumstances over current solid-state method such as multi-component system can desirable with high homogeneity (Mercadell et al., 2008)
The sol-gel operation known as an arrangement of an oxide system through polycondensation reactions of an atomic forerunner in a liquid. A sol, steady scattering of colloidal particles in a stable. The components may be amorphous or crystalline. For utmost part, the sol particles collaborated by van der Waals strengths or hydrogen bonds. A gel may likewise be framed from connecting polymer chains. In gel frameworks utilized for materials combination, the associations are of a equivalent nature and the gel procedure is permanent. Amidst these processes the based citrate-nitrate sol-gel burning procedure is a method to deliver multicomponent oxide clay powders in a straightforward and financial way. Nowadays, this technique, has been utilized to create uniform and exceedingly receptive crystalline powders. The sol-gel process prompts accomplish a consistent cations appropriation by crosslinking a concentrated arrangement of carboxylate-metal buildings into a 3D gel.

The combustion synthesis, portrayed by huge temperatures, quick warming rates, and brief response times, responses between an oxidizer (metal nitrates) and a fuel (citric extract), manage started in a furnace at the temperature lower than 500 °C. The extract assumes two essential parts: it is the fuel for the burning response and it shapes durable buildings with metal particles keeping the precipitated hydroxylated mixes. In addition, citrate gel gives off an impression of being the minimum hazardous and, along these lines, generally more secure fuel (Badapanda et al., 2013)

The fundamental objective of this trial was to set up the better amalgamation parameters expected to create fine BNT-BT powders by citrate-nitrate sol–gel ignition method. In any case, there is no writing wrote about the arrangement and electrical properties of BNT samples, that have somewhat ferroelectric properties have slightly ferroelectric properties have been reported. A few reports on BNT-BT synthesis using sol-gel method are published. BaTiO₃ ceramics are prepared and doped into a solution for maintaining a strategic distance from the loss of Bi and Na amid the sintering process Bi₀.₅Na₀.₅TiO₃ by sol-gel strategy (Mercadelli et al., 2008)
1.2 PROBLEM STATEMENT

Once, strong arrangement of lead PZT are the huge broadly utilized for piezoelectric applications because of magnificent piezoelectric properties. Despite, the investigation is recently on lead-free piezoelectric ceramics, as an outcome of ecological controversy emerging from the lead harmfulness (Reichmann, Feteira, & Li, 2015). BNT-based ceramics production demonstrates an incredible prospect for ecological security as well as for different application, particularly in the piezoelectric application. However, real disadvantage connected with BNT is that it has exceptionally poor sinterability which confines its applications. The present of intrinsic point defects as well as loss of volatile compounds when sintered at high temperature. Accordingly, to enhance the properties of BNT production, Barium Titanate (BaTiO$_3$/BT) was acquainted for doping with BNT. As this solid-solution formed, BNT-BT, as examined by demonstrated a decent pooling conduct and hence fascinating piezoelectric properties.

1.3 OBJECTIVES OF RESEARCH

The objective of this research are:

1. To prepare Sodium Bismuth Titanate (BNT) doped by Barium Titanate (BaTiO$_3$) ceramics by using a sol-gel method.
2. To determine the phase formation and structure of Sodium Bismuth Titanate doped by Barium Titanate.
3. To determine the electrical properties of Sodium Bismuth Titanate doped by Barium Titanate.

1.4 SCOPE OF STUDY

Sodium Bismuth Titanate and Barium Titanate are used in this research. There is some modification composition of Sodium Bismuth Titanate which doped by different ratio of Barium Titanate using a sol-gel method.