

ALTERNATIVE SYNTHESIS TECHNIQUES FOR BIMEVOX MATERIALS

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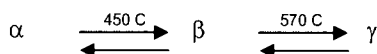
ABSTRACT

α - $\text{Bi}_4\text{V}_2\text{O}_{11}$ has been synthesized by the citrate technique. The thermal evolution of the material was followed by powder X-ray diffraction (XRD) and differential thermal analysis (DTA). The synthesis of the final material is obtained via the formation of the intermediate BiVO_4 phase. Complete disappearance of BiVO_4 and completion of the reaction can only be achieved after the sample is annealed at 750°C leading to high purity $\text{Bi}_4\text{V}_2\text{O}_{11}$ in the orthorhombic α -phase.

Key words: oxide conductor, BIMEVOX, synthesis

INTRODUCTION

Aurivillius phases have the general formula $\text{Bi}_2\text{O}_2(\text{A}_{n-1}\text{B}_n\text{O}_{3n+1})$ and can be described as layered structures, consisting of perovskite blocks sandwiched between fluorite-like $(\text{Bi}_2\text{O}_2)^{2+}$ sheets. Amongst these materials, $\text{Bi}_2\text{VO}_{5.5}$ is a one-layer Aurivillius phase presenting two main phase transitions that can be schematized as follows:



Very high ion conductivity is observed in its high temperature γ form which is characterized by the distortion of the V-O octahedra and oxygen vacancy disorder that disappears on cooling⁽¹⁾.

It is also the parent structure of the so-called BIMEVOX materials (BI for Bismuth, ME for metal ion, V for Vanadium, and OX for oxide), where the Vanadium is partially replaced by other cations in order to stabilize the γ phase at lower temperature, but usually lead to a degradation of the ionic conductivity.

Alternative synthesis routes to the traditional solid-state reaction, particularly those inducing a reduction of the size of the particles, might be able to improve the physical properties of these materials⁽²⁾. Obtention of α and γ - $\text{Bi}_4\text{V}_2\text{O}_{11}$ have been reported by sol-gel⁽³⁾ and co-precipitation technique⁽⁴⁾, this last technique produces fully crystalline $\text{Bi}_4\text{V}_2\text{O}_{11}$ at 320°C .

Here we present the studies by X-ray diffraction (XRD) and differential thermal analysis (DTA) of $\text{Bi}_2\text{VO}_{5.5}$ prepared by the citrate (Pechini) method.

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