OPTIMALIZATION OF ELECTRICAL PARAMETERS OF Bi_2O_3-Al_2O_3-SiO_2

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The δ phase of bismuth oxide (Bi_2O_3) is widely recognized as one of the most efficient oxide ion conductors, yet its stability is typically restricted to high temperatures above 730°C. Recent research has demonstrated that this fluorite-type phase can be effectively stabilized down to room temperature through the confinement of nanograins within an amorphous matrix [1]-[3]. The studies focused mainly on glass-ceramic composites of the ternary Bi_2O_3–Al_2O_3–SiO_2 system.

While preliminary investigations into these composites have shown promising oxygen ion transport numbers (0.89–0.94) and grain conductivities reaching 1 mS/cm at 507°C, the total conductivity remains more than an order of magnitude lower.

In this work, we aimed at bridging this gap by modifying the material's morphology through controlled thermal nanocrystallization of the glass.

A combination of in situ impedance spectroscopy, X-ray diffraction, and thermal analysis techniques allowed us to understand the processes responsible for changes in electrical parameters as a function of temperature.

Our study is the next step to enhance properties of Bi_2O_3 -based glass-ceramics, furthering their potential application as electrolytes in intermediate-temperature fuel cells.

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