

PRELIMINARY STUDIES ON THE SYNTHESIS AND CHARACTERIZATION OF BaSn(OH)₆ AS A PRECURSOR FOR PEROVSKITE BARIUM STANNATE CERAMICS

Cristian Casut^{1,3}, Marinela Miclau¹, Daniel Ursu¹, Nicolae Miclau², Iosif Malaescu³, Alina Zamfir^{1,3}

¹ National Institute for Research and Development in Electrochemistry and Condensed Matter, 1 Plautius Andronescu Street, 300224 Timisoara, Romania

² Politehnica University Timisoara, Str. PiataVictoriei, nr.2, 300006 Timisoara, Romania

³ West University of Timisoara, Bulevardul Vasile Pârvan 4, Timișoara 300223 Timisoara, Romania

Functional perovskite oxides may enable entirely new electronic device paradigms, ranging from negative capacitance to charge amplification in phase change devices. A major challenge is the intrinsically poor charge carrier mobility of most perovskite oxides, typically no better than $1^{-10} \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$ at room temperature.[1] There has been growing interest in perovskite BaSnO₃ due to its desirable properties for oxide electronic devices including high electron mobility at room temperature and optical transparency.[2] Because of its high chemical and thermal stability, BaSnO₃ can be potentially used at high temperature as a protective coating or catalyst support. The pure compound is an insulator at room temperature and becomes semiconducting when doped with donor impurities such as Sb⁵⁺ and La³⁺. [3].

Usually, ceramic powders of BaSnO₃ are prepared by solid-state reaction between BaCO₃ and SnO₂ at 1000–1200 °C. Polycrystalline materials can be obtained by sintering at 1400–1600 °C, but good densification is difficult to achieve. In this study, we propose using BaSn(OH)₆ as precursor for the synthesis of BaSnO₃ ceramics. BaSn(OH)₆ acicular crystals were obtained by a simple precipitation at 80°C from Na₂SnO₃ and Ba(NO₃)₂ aqueous solutions and their transformation in the perovskite like compound BaSnO₃ was demonstrated by TG-DTA analysis.

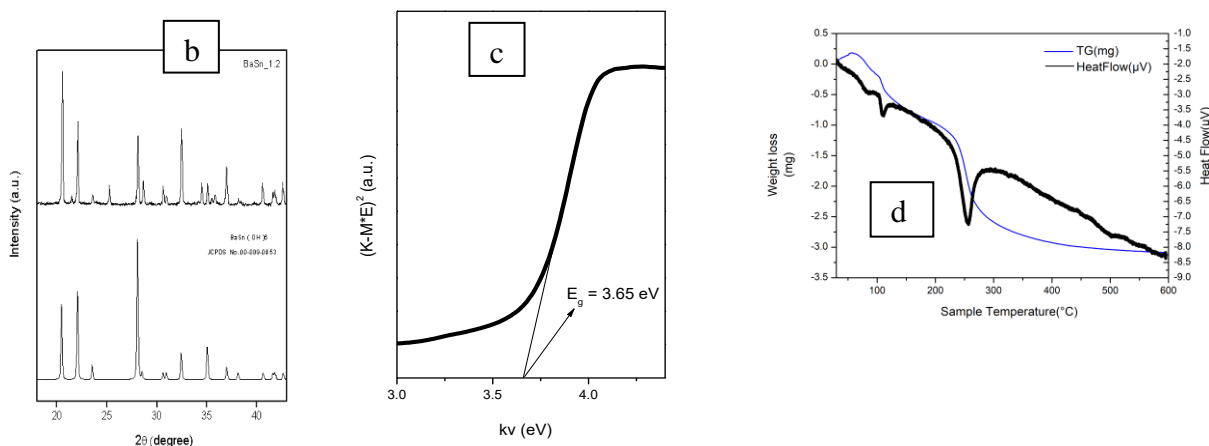
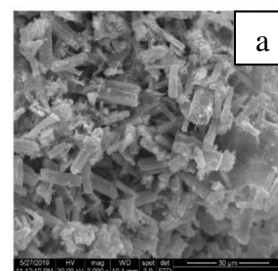


Figure 1: a) SEM image of BaSn(OH)₆; b) X-ray diffraction patterns of BaSn(OH)₆; c) UV-VIS-NIR of BaSn(OH)₆; d) TG-DTA analysis of BaSn(OH)₆ in argon

References

- 1 S. Raghavan, High-mobility BaSnO₃ grown by oxide molecular beam epitaxy, APL Mater. 4, 2016
- 2 M.T. Buscaglia, *Synthesis and characterization of BaSn(OH)₆ and BaSnO₃ acicular particles*, J. Mater. Res., 2003
- 3 H. Yun, *Electronic structure of BaSnO₃ investigated by high-energy resolution electron energy-loss spectroscopy and ab initio calculations*, Journal of Vacuum Science & Technology, 2018