Área: FIS

Synthesis and Processing of $SrTiO_3$: Potential for Advances in Photovoltaic Technologies

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Highlights

$SrTiO_3$ ceramics were synthesized using the Pechini polymeric precursor route. Spark Plasma Sintering enabled the production of dense ceramic targets at 900 °C. The material is suitable for thin film deposition applications, and future analyses will confirm the formation of the perovskite phase.

Resumo/Abstract

The increasing global demand for clean and renewable energy sources, driven by technological advances, population growth, and industrial expansion, has intensified the search for efficient and sustainable materials for photovoltaic applications. Solar energy stands out due to its global availability, renewability, and low environmental impact, positioning it as a key player in the transition to sustainable energy systems.

Among the materials investigated, perovskite-type oxides have attracted significant attention for their unique optical and electrical properties. Strontium titanate ($SrTiO_3$), a ceramic oxide with ABO_3 perovskite structure, exhibits high chemical stability and promising characteristics for energy-related applications.

In this study, $SrTiO_3$ was synthesized via the Pechini method, involving the formation of a polymeric resin from strontium nitrate, titanium butoxide, citric acid, and ethylene glycol. After gel formation, the resin underwent thermal treatment at 300 °C to remove organic compounds, followed by calcination at 450 °C to decompose the polymeric matrix. The resulting powder was sintered using Spark Plasma Sintering (SPS) at 900 °C under 50 MPa, yielding dense ceramic targets.

The results demonstrate that the Pechini method combined with SPS is effective for producing compact $SrTiO_3$ ceramics suitable for thin film deposition. Future characterization techniques such as X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), energy-dispersive X-ray spectroscopy (EDS), and scanning electron microscopy (MEV) are recommended to confirm the formation of the perovskite phase and provide deeper insight into the material's properties.

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