

## La-doped Barium Tin Oxide Thin Films – Indium Tin Oxide (ITO) Alternative

Indium Tin Oxide (ITO) is used as a transparent conducting oxide (TCO) film in electronics, displays, windows and other devices. ITO is expensive due to the price of Indium which is becoming scarce. Previous attempts at using Lanthanum doped Barium Tin (Stannate) Oxide (LBSO) as a replacement for ITO faced several challenges, such as low reproducibility, inferior electronic properties and low tin oxidation potential. Less expensive alternatives to ITO with better properties are needed.

### Description of the Invention

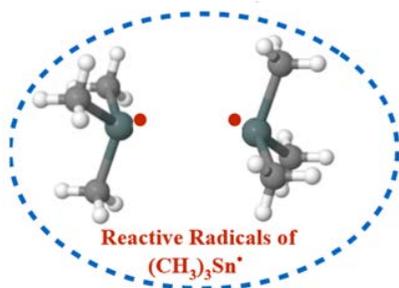
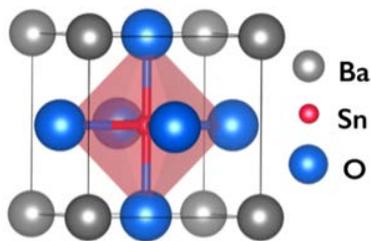
A novel process produces Lanthanum doped Barium Tin (Stannate) Oxide (LBSO) for use as a transparent conducting film (TCO). The highly reproducible and commercially scalable method produces highly transparent thin films with high room-temperature conductivity and mobility. The synthesis method, a radical-based hybrid chemical beam approach, uses a chemical precursor for tin as a substitute for a solid tin source. The room temperature conductivity of these films is comparable to the best reported values for indium-doped tin oxide (ITO), the industry standard TCO.

### Features and Benefits

- Viable ITO alternative
- Very stable at high temperatures (~800 °C in air, ~600 °C in vacuum)
- Superior conductivity  $>10^4$  S  $\text{cm}^{-1}$  (comparable to best-reported ITO values)
- High room-temperature mobility (Up to  $120 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$ )
- Excellent sheet resistance (2-5 ohms per square for 120 nm thick film)
- High reproducibility
- Highly scalable process
- Highly transparent/low haze films
- Improved structural quality

### Potential Applications

- ITO replacement (i.e., for touch screens, liquid crystal displays, conductive window heaters, head-up displays, plasma displays, aircraft windshields, organic LEDs, solar panels)
- Transparent conductive films (TCF)
- Semiconductors
- Electronics



### Technology Status

Proof of concept

### Publications

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### IP Status

Patent Pending

### Primary Inventor(s)

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### Case Reference

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