

# **Characterization and Comparative Studies on Thin Films of Oxides Prepared By Chemical Methods**

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Thin film science has received tremendous attention in recent years because of the numerous applications of films in diverse fields such as the electronics industry, military weapon systems, space science, solar energy utilization, as optical and superconducting film materials and also as high memory computer elements and sensors. A casual comparison of film behavior and physical-chemical characteristics revealed the sensitivity of film properties to preparative conditions. The numerous applications of films led to an intense study of them, particularly, to develop and prepare better films with specialized properties.

Transparent conducting oxide (TCO) films such as tin oxide have been extensively used in recent years as they exhibit more stable mechanical and chemical properties as compared with thin films of other oxides. Tin oxide thin films can transmit useful solar radiation. The reflectivity from the tin oxide surface is very small (< 10%). Besides, it is a widely available and inexpensive material that can be prepared by several methods. These characteristics along with its availability make tin oxide films ideal for use in solar cells, gas sensors, and other electronic devices. The performance of tin oxide devices is strongly influenced by the film structure, and its electrical and optical properties. As they exhibit very good transparency in the visible region, high reflectance in the IR region and high conductivity, tin oxide based thin film devices are useful in many fields such as display devices, solar cells, gas sensors, anti-reflecting coating and transparent heating elements for aircrafts.

This project deals with the preparation of thin films of tin oxide by two chemical methods, namely spray pyrolysis and spin coating. The optical, electrical and structural properties of oxide films strongly depend on the quality of the film which in turn depends on the deposition techniques and conditions.

Using 0.1 M solution, tin oxide ( $\text{SnO}_2$ ) was deposited on glass substrates by spray pyrolysis for three substrate temperatures (350 °C, 380 °C and 410 °C).

Using 0.4 M and 0.5 M solution, one to five layers of tin oxide ( $\text{SnO}_2$ ) film were prepared on glass substrates by spin coating.

These films were characterized for their optical, electrical and structural properties. A comparative study of the properties of the prepared films was carried out.