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## Transparent and Conducting $\text{TiO}_2\text{:Nb}$ Thin Films Prepared by Spray Pyrolysis Technique

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To date, only sputtering and pulsed laser deposition (PLD) techniques have been employed successfully to fabricate highly conducting and transparent  $\text{TiO}_2\text{:Nb}$  (TNO) films. In this article, we demonstrate that transparent and conducting  $\text{TiO}_2\text{:Nb}$  films can be made by the spray pyrolysis technique. The films were deposited on Corning 7059 glass substrates at  $500 \pm 15^\circ\text{C}$  using an alcoholic precursor solution consisting of titanium (iv) isopropoxide and  $\text{NbCl}_5$ . The influence of increasing Nb concentration on the electrical, optical and structural properties was investigated. The minimum resistivity,  $3.36 \times 10^{-3} \Omega \text{ cm}$ , for  $\text{Ti}_{1-x}\text{Nb}_x\text{O}_2$  film ( $x = 0.15$ ) was obtained after 1 hour post deposition annealing in hydrogen atmosphere at  $500^\circ\text{C}$ . The x-ray diffraction of hydrogen annealed films showed a polycrystalline anatase (004)-oriented phase without any second phases. The optical band gap for undoped and doped films lay in the range 3.38 – 3.47 eV. Using dispersion analysis, optical constants were determined from spectrophotometric measurements for films on glass.

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