

**Title of the M.Sc thesis:**

**Effects of Lithium Ion on the Structural, Morphological, Optical and Electron Transport Properties of TiO<sub>2</sub> Thin Films Synthesized by Spray Pyrolysis**

**By**

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**Abstract**

Thin films of Lithium (Li) doped Titanium dioxide (TiO<sub>2</sub>) thin films have been synthesized by spray pyrolysis technique onto the glass substrates at 400 °C . The surface morphology, structural, and optical and electrical properties of Li-doped TiO<sub>2</sub> thin films have been investigated by Field-Emission Scanning Electron Microscopy (FESEM), Energy-dispersive X-ray spectroscopy (EDX), X-ray diffraction (XRD), UV-Visible spectroscopy, and four-point probe method. The surface morphological, structural, optical, and electrical properties of pristine and Li doped TiO<sub>2</sub> thin films have been investigated with doping concentrations of 0, 2, 4, 6, and 8 at. % of Li. The FESEM investigations of pristine and Li-doped TiO<sub>2</sub> films have shown the porous structure. The XRD pattern of pristine and Li doped TiO<sub>2</sub> thin films confirm the tetragonal structure with anatase phase. The characterization results show that thin films with high crystallinity and Li substitution effect lead to decreased crystalline size. The optical properties were studied using UV-Visible spectroscopy in the wavelength range of 300-1000 nm. The calculated band gap for pristine TiO<sub>2</sub> was found at 3.78 eV and for 2, 4, 6, and 8 at. % Li doped TiO<sub>2</sub> thin films were 3.72 eV, 3.70 eV, 3.41 eV and 3.35 eV, respectively. The electrical properties were also studied using the four-probe method. It explains the semiconducting nature of the pristine and Li-doped TiO<sub>2</sub> thin films.