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## Electronic and Electrical Properties of Transparent Conducting Nickel Oxide Thin Films

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The electronic and electrical properties of nickel oxide (NiO) thin films were investigated by reflection electron energy loss spectroscopy (REELS), x-ray photoelectron spectroscopy (XPS), and Hall Effect measurements. REELS spectra revealed that the band gap of the NiO thin film was increased from 3.50 eV to 4.02 eV after annealing the sample at 800°C. Our XPS spectra showed that the amount of Ni<sub>2</sub>O<sub>3</sub> decreased after annealing. The Hall Effect results showed that the doping type of the sample changed from n type to p type after annealing. The resistivity decreased drastically from  $4.6 \times 10^3$  to  $3.5 \times 10^{-2} \Omega \cdot \text{cm}$ . The mobility of NiO thin films was changed from  $3.29 \times 10^3$  to  $3.09 \times 10^5 \text{ cm}^2/\text{V}\cdot\text{s}$ . Our results showed that the annealing temperature plays a crucial role in increasing the carrier concentration and the mobility which leads to lowering resistivity of NiO thin films.

**Keywords:** NiO, XPS, REELS, Electronic and electrical properties