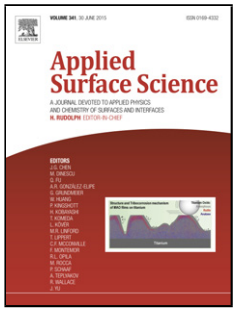

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Enhanced electrical properties of ZnO transparent conducting films prepared by electron beam annealing

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Highlights of the paper:

- EB annealing replacing conventional furnace annealing is used for the preparation of pure ZnO transparent conducting thin films.
- The annealing duration is only about 5 min.
- The electrical properties of ZnO films greatly enhanced.
- The film annealed with 0.7 mA presents resistivity value of 1.57×10^{-2} Ωcm and carrier concentration as high as 6.37×10^{19} cm^{-3}.

Keywords: ZnO, Transparent conducting films, Electrical properties, sol-gel method, electron beam annealing

Abstract. Pure ZnO precursor films were prepared by a sol-gel spin coating method. The films were directly annealed by the electron beam (EB) for 5 min. The structural, optical and electrical properties were investigated by means of SEM, AFM, XRD, UV-Visible spectrophotometer and Hall-effect measurement. SEM and AFM studies revealed smooth, dense film microstructure with some holes. The average grain size ranged from 10 nm to 60 nm and the surface RMS roughness of the films is less than 3 nm. X-rays diffraction patterns showed (002) preferential growth in all annealed films. From optical transmittance spectra, the absorption edge of the films was determined to be at ~380 nm with > 85% transmittance in visible region. ZnO film annealed with