

## MASTER'S THESIS

### Electrical and optical properties of indium tin oxide

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## ABSTRACT

In recent years, portable devices and larger display are the trend of market, so transparent conducting oxides (TCO) draw a considerable interest due to their unique characteristics and essential role in the technology of flat panel display. Indium tin oxide (ITO) is one of the most widely used TCO in the application of display technology. In this work, properties of ITO thin film as a function of dopant ratio and density of sputtering targets had been done. It is found that the mechanism of oxygen vacancies is more dominated in electrical conduction than dopant concentration. Meanwhile, the conductivity of ITO thin film depends on the sputtering condition than the target itself. Annealing process is one of the ways to enhance the optical properties of ITO thin film. This process can change the crystal structure of film from amorphous to crystalline but limited by the presence of the oxygen.

Apart from the transitional single layer of ITO thin film, a modified structure had been done by inserting a thin layer of metal (Al/Ag) into ITO which provides a highway for carrier transport. A modified structure with Ag is successfully demonstrated and well agrees with the theory. OLED application was also done by using sandwich structure. The key of sandwich structure is the metal layer, non-reactive and highly conducting material should be selected. Upper and bottom TCO layers are purpose-built for application without affect the properties of structure. This structure also shows more robust on the flexible substrate than single layer ITO.

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