

## MASTER'S THESIS

### Photothermal deflection spectroscopy of novel electronic materials

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**Photothermal Deflection Spectroscopy of  
Novel Electronic Materials**

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**A thesis submitted in partial fulfilment of the  
requirements for the degree of  
Master of Philosophy**

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## **Abstract**

A computerized photothermal deflection spectroscopy (PDS) system was constructed to characterize the optical absorption of novel electronic materials. The experimental setup, techniques, and procedures are discussed in detail. The spectroscopy was tested and optimized by means of standard samples of semi-insulating (SI) GaAs and InP. Both semiconductor-based and organic/polymer-based electronic materials were investigated by PDS. The semiconductor materials studied include ion-implanted SI-GaAs, low temperature grown molecular beam epitaxial GaAs, and porous silicon; the optical absorptions of organic/polymer-based electronic materials studied include polyetherimide, polybenzimidazole, polyetherether ketone, polycarbonate, polyimide, mlyar, and low density polyethylene. Transmission measurement was complementarily used to calibrate the absorption obtained by PDS. Finally, to demonstrate how PDS can apply to an actual device, say 8-hydroxyquinoline aluminium (Alq) light emitting diode (LED), the Alq material was optically characterized by PDS, and complementarily studied by UV spectrophotometer, transmission measurement, and photoluminescence. In addition, morphology of Alq material was studied by X-ray diffraction and atomic force microscopy.

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