

## MASTER'S THESIS

### Study of stimulated emission from light emitting polymers

Chan, Kin Long

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# **Study of Stimulated Emission from Light Emitting Polymers**

CHAN Kin Long

A thesis submitted in partial fulfillment of the requirements

for the degree of

Master of Philosophy

Principal Supervisor: Prof. CHEAH Kok Wai

Hong Kong Baptist University

Aug 2015

## **DECLARATION**

I hereby declare that this thesis represents my own work which has been done after registration for the degree of MPhil at Hong Kong Baptist University, and has not been previously included in a thesis or dissertation submitted to this or other institution for a degree or other qualifications.

Signature: \_\_\_\_\_

Date: Aug 2015

## ABSTRACT

Efficient and high light amplification of optical resonator in organic laser is one of the critical factors for high performance organic laser. It can be achieved by using microcavity and DFB structures, which are commonly adopted methods to enhance light amplification in specific wavelength. Both of them are the more widely used structures in inorganic and organic lasers. In this work, we employed nearly 100% reflection (at 450 nm) DBR and Al to act as reflected mirror inside the microcavity device. The function of microcavity has been examined to show the ability of device in tuning laser emission wavelength and overcoming the loss of organic-metal interface. DFB structure was used to demonstrate different laser emissions with respect to different grating periods. The finding clarifies the role of the structure in enhancement of light amplification leading to lower threshold, which was half of that of amplified spontaneous emission from single layer of PFO. As designed laser mode is also an important factor to get a high performance organic laser, those laser modes of structures have been designed and estimated by simulations and consistent with the experimental results.

Color tunable light source has great potential for display, lighting and bio-imaging. Current broadband light sources, however, have their own limitations in beam divergence and device size. In this work, we demonstrated a spatially variant light source with tunable color emission property by using two cascaded organic thin films, which emit blue and green ASE respectively under optical pumping. By spatially selecting the overlapping of the directional ASE from the cascaded films, we show that the color of light emission can be continuously tuned from blue, white to green.

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