

## MASTER'S THESIS

### Luminescent metallated systems of dansylamide and acridone

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**Luminescent Metallated Systems of Dansylamide and  
Acridone**

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

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## Abstract

The molecular design, synthesis, spectroscopic and photophysical characterization of a new series of transition metal-containing complexes and polymers incorporating dansyl and acridone chromophores are discussed. The applications of some of these compounds in photovoltaic devices and materials science are also outlined.

Chapter 1 contains a brief overview on the background of metal-containing complexes and their role in the fields of photovoltaic and solar cell devices and organic light-emitting diodes (OLEDs). The chemistry and utility of some common luminophores such as acridone, dansyl unit, phenothiazine and anthraquinone in material research are also discussed.

Chapter 2 presents the synthetic methodology and characterization of a series of new metal-acetylide complexes and polymers containing acridone and dicyanomethylene-substituted acridone chromophores. In addition, UV/Vis and photoluminescence spectroscopic methods were applied to observe the photophysical and molecular properties of the novel metal polymers and complexes. Tuning of the band gaps is accomplished by modification of the acridone ring based on dicyanomethylene substitution. The strong ICT in CN-based Pt polymers confers upon this push-pull polymer a band gap of 2.10 eV and this has opened a versatile avenue to

narrow-gap metal-containing copolymers.

A full account of the preparation, characterization, photophysical and thermal properties of a new series of polyplatinaynes containing various fluorescent organic cores and different oligothieryl chain length are presented in Chapter 3. Some of the metallopolymers have been fabricated into photovoltaic and solar cell devices and found to have efficient power conversion efficiency of up to 1.5 %. Given the excellent solution-processability as well as performance advantage, this work has great potential for enhancing the light-to-electricity conversion efficiencies of polymer solar cells to a level of practical applications without the need for exploiting the triplet excited states in promoting an efficient photoinduced charge separation.

In Chapter 4, the synthesis and characterization of a new series of metal  $\sigma$ -acetylide complexes based on highly fluorescent dansyl unit are described. All of the complexes exhibit intense absorptions in the ultraviolet region and give intense luminescence at room temperature. The dansyl chromophore helps to greatly modify the fluorescent property of the metal complexes, allowing them to be good examples and models as chemosensors and probes for metal ions.

Chapters 5 and 6 present the concluding remarks and the experimental details of the work described in Chapters 2–4.

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