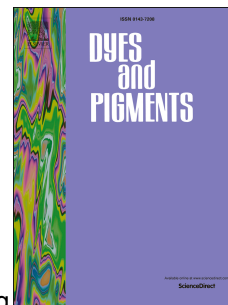


# Accepted Manuscript

Novel electron-deficient quinoxalinedithienothiophene- and phenazinedithienothiophene-based photosensitizers: The effect of conjugation expansion on DSSC performance

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# Phenazinedithienothiophene-Based Photosensitizers: the Effect of Conjugation Expansion on DSSC Performance

Lanqi Huang,<sup>a</sup> Pin Ma,<sup>b</sup> Guowei Deng,<sup>c</sup> Kai Zhang,<sup>a,d</sup> Ting Ou,<sup>e</sup> Yuan Lin,<sup>b,\*</sup> and Man Shing Wong<sup>a,\*</sup>

<sup>a</sup>Institute of Molecular Functional Materials, Department of Chemistry and Institute of Advanced Materials, Hong Kong Baptist University, Kowloon Tong, Hong Kong SAR, China.

<sup>b</sup>Institute of Photo-functional Materials and Photo-electrochemistry, Institute of Chemistry, Chinese Academy of Science, Haidian, Beijing, China.

<sup>c</sup>College of Chemistry and Life Science, Chengdu Normal University, China, Sichuan, China.

<sup>d</sup>College of Preclinical Medicine, Southwest Medical University, Luzhou 646000, Sichuan, China.

<sup>e</sup>Nanocluster Laboratory, Institute of Molecular Science, Shanxi University, Taiyuan 030006, China.

## Abstract:

Two novel electron-deficient  $\pi$ -conjugated moieties, quinoxalinedithienothiophene (QBTT) and phenazinedithieno-thiophene (PBTT) were designed and synthesized as the  $\pi$ -bridge for the construction of D- $\pi$ -A and D-A<sub>1</sub>- $\pi$ -A configured photosensitizers for DSSC applications. Five new metal free photosensitizers, namely QC5-m and PC5-n where m = 1-2 and n = 1-3 were designed and synthesized using carbazole as an electron-donor, benzothiadiazole (BTZ) as an auxiliary group and cyanoacrylic acid as an electron-acceptor. Despite only lateral  $\pi$ -conjugation expansion of PBTT  $\pi$ -bridge, PC5-n based dyes show broader spectral absorption than those of QC5-m counterparts. Both electron-deficient QBTT and PBTT moieties are found to be a useful  $\pi$ -conjugated bridge to achieve broad spectral absorption and strong charge transfer of a photosensitizer. DSSCs based on these photosensitizers were fabricated and investigated which exhibited power conversion efficiency (*PCE*) in the range of 5.23-7.77% with a simple sandwich structure under AM 1.5 irradiation, 100 mW cm<sup>-1</sup>. Among DSSCs fabricated, PC5-1 based device afforded the best photovoltaic performance with *PCE* up to 7.77%, *V*<sub>oc</sub> = 692 mV, *J*<sub>sc</sub> = 15.6 mA cm<sup>-2</sup> and FF = 72%. Consistently, the EIS and IMVS studies showed that PC5-1 based device exhibited the most efficient

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