

13<sup>TH</sup> INTERNATIONAL CONFERENCE ON

## ADVANCED MATERIALS AND NANOTECHNOLOGY

OCTOBER 26-28, 2017 OSAKA, JAPAN

**Non-linear optical properties of the WS<sub>2</sub> and its pulsed laser applications**Yuen Hong Tsang<sup>1</sup>, Longhui Zeng<sup>1</sup>, Lili Tao<sup>1</sup>, Chun Yin Tang<sup>1</sup>, Hui Long<sup>1</sup>, Guowen Liang<sup>2</sup> and Qiao Wen<sup>2</sup><sup>1</sup>The Hong Kong Polytechnic University, China<sup>2</sup>Shenzhen University, China

To understand and modify the nonlinear optical properties of transition metal dichalcogenides, TMDs, two-dimensional layered materials are very important research topics nowadays as they can serve as building block for developing next generation high performance micro optics and photonic devices. These materials are very compact with atomic thick layer and have natural band-gap so they can provides strong interaction with light and other favorable features e.g. broadband absorption, transparent and high carrier mobility etc. WS<sub>2</sub>, which is a typical TMDs material, has layer number depending band gap energy. The WS<sub>2</sub> band gap energy and optical properties can be modified by varying their size, layer number and structures. The WS<sub>2</sub> nanomaterials and film in various size, layer number or film thickness are fabricated by two methods-ultrasounds and sputtering. The nonlinear optical properties of different samples are then studied by using z-scan technique. We have successfully demonstrated some viable methods to tune the nonlinear absorption properties of WS<sub>2</sub>. We also use the fabricated WS<sub>2</sub> film within the diode pumped solid state Nd:YVO<sub>4</sub> crystal laser to generate pulsed laser output. A stable pulsed laser operation is achieved by using the fabricated WS<sub>2</sub> saturable absorber. The average output power obtained is 19.6 mW (135 kHz). These research findings indicate strong nonlinear optical properties of WS<sub>2</sub> and high potential for nonlinear optical devices.

**Biography**

Yuen Hong Tsang has completed his BSc and PhD from the School of Physics and Astronomy, University of Manchester in UK. He is presently an Assistant Professor in Applied Physics Department, The Hong Kong Polytechnic University. He has published 100 SCI international journals. His current research interests include development of novel 2D materials, e.g., MoS<sub>2</sub>, WS<sub>2</sub>, etc., for laser photonics, photo-catalysis, solar energy conversion applications, like photo-catalyst, solar heat absorber, saturable absorber, optical limiter, photo-detection, Q-switched and mode locked lasers, etc.

Yuen.Tsang@polyu.edu.hk

**Notes:**