



## DEVELOPMENT OF A COMBINED PSP/TSP SENSOR USING QUANTUM DOT

T. KAMEYA<sup>1,c</sup>, Y. MATSUDA<sup>1</sup>, Y. EGAMI<sup>2</sup>, H. LI<sup>1</sup>, H. YAMAGUCHI<sup>1</sup>, T. NIIMI<sup>1</sup>

<sup>1</sup> Department of Micro-Nano Systems Engineering, Nagoya University, Aichi, 464-8603, Japan

<sup>2</sup> Department of Mechanical Engineering, Aichi Institute of Technology, Aichi, 470-0392, Japan

<sup>c</sup>Corresponding author: Tel.: +81 52-789-2704; Fax: +81 52-789-3124;

Email: kameya.tomohiro@c.mbox.nagoya-u.ac.jp

### KEYWORDS:

**Main subjects:** Combined sensor, Pressure measurement, Temperature measurement

**Fluid:** Air

**Visualization method(s):** Pressure-Sensitive Paint, Temperature-Sensitive Paint

**Other keywords:** Quantum dot

**ABSTRACT:** Pressure-Sensitive Paint (PSP) has been utilized for non-invasive pressure measurements on solid surfaces; pressure is deduced from the luminescent intensity of PSP. Since the intensity is influenced not only by pressure but also by temperature, it has to be compensated by the surface temperature. A Temperature-Sensitive Paint (TSP) technique, by which temperature is obtained in a similar way to PSP, is a promising one to measure the temperature. In this paper, we propose a PSP/TSP combined sensor using PtTFPP and quantum dot as luminophore of PSP and TSP, respectively. Quantum dot has a large potential as TSP luminophore of the sensor because of its high quantum yield, broad absorption band and tunable luminescent peak wavelength. We chose the quantum dot with the peak wavelength around 530 nm to separate its luminescence from that of PtTFPP with an optical filter (Fig. 1). As shown in Fig. 2, PtTFPP has high pressure sensitivity around an atmospheric pressure, while quantum dot is insensitive to pressure. It is also clear that quantum dot has sufficient temperature sensitivity around room temperature (Fig. 3).

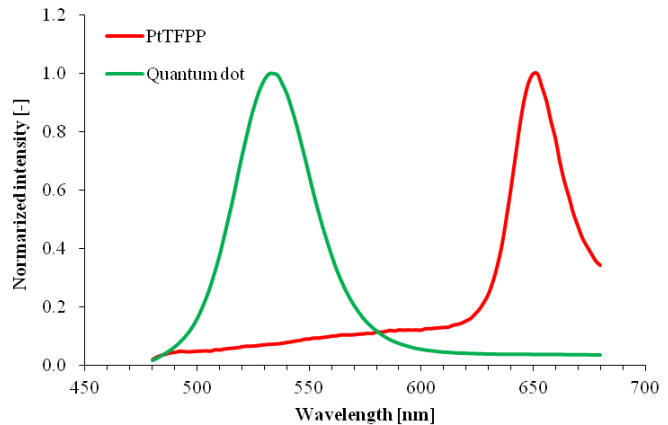


Fig. 1 Spectra of the PSP/TSP combined sensor

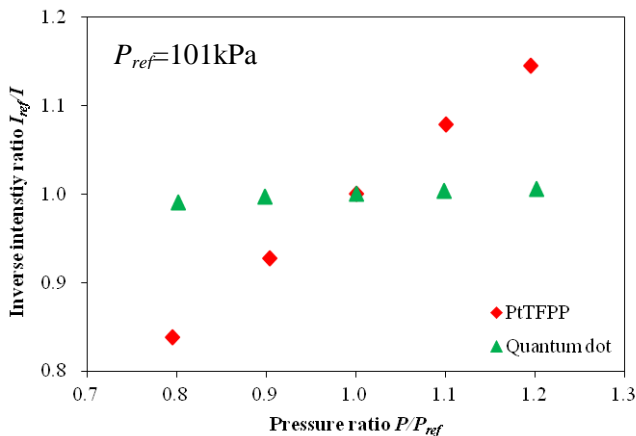


Fig. 2 Stern-Volmer plot around an atmospheric pressure

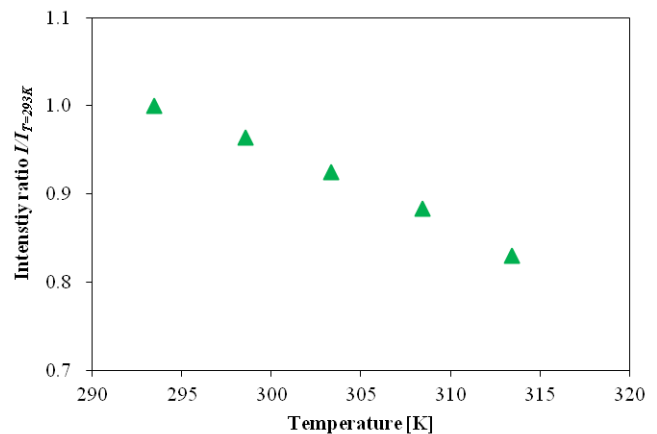


Fig. 3 Temperature sensitivity of quantum dot