

Electronic Supplementary Information (ESI)

**3D printed O<sub>2</sub> indicators**

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## S1: Absorption and emission wavelength of the PtTFPP dye in different media

Table S1.1: Absorption and emission wavelength of the PtTFPP dye in different media

Sensor	$\lambda_{\max}$ absorption (nm)	$\lambda_{\max}$ emission (nm)	Ref
PtTFPP in toluene	390, 504, 538	647, 705 (sh)	1
3D printed PtTFPP/SiO <sub>2</sub> /LDPE dot	390, 509, 543	642	This work
3D printed PtTFPP/SiO <sub>2</sub> /PLA dot	390, 509, 543	645	This work
FOSPOR	-	643	This work
PtTFPP-PS	395, 508, 541	650	2

Sh: shoulder peak

[1] Lai, Siu-Wai, Yuan-Jun Hou, Chi-Ming Che, Hei-Leung Pang, Kwok-Yin Wong, Chi K. Chang, and Nianyong Zhu, *Inorg. Chem.*, 2004, **43**, 3724-3732.

[2] Lee, Sang-Kyung, and Ichiro Okura, *Anal. Commun.*, 1997, **34**, 185-188.

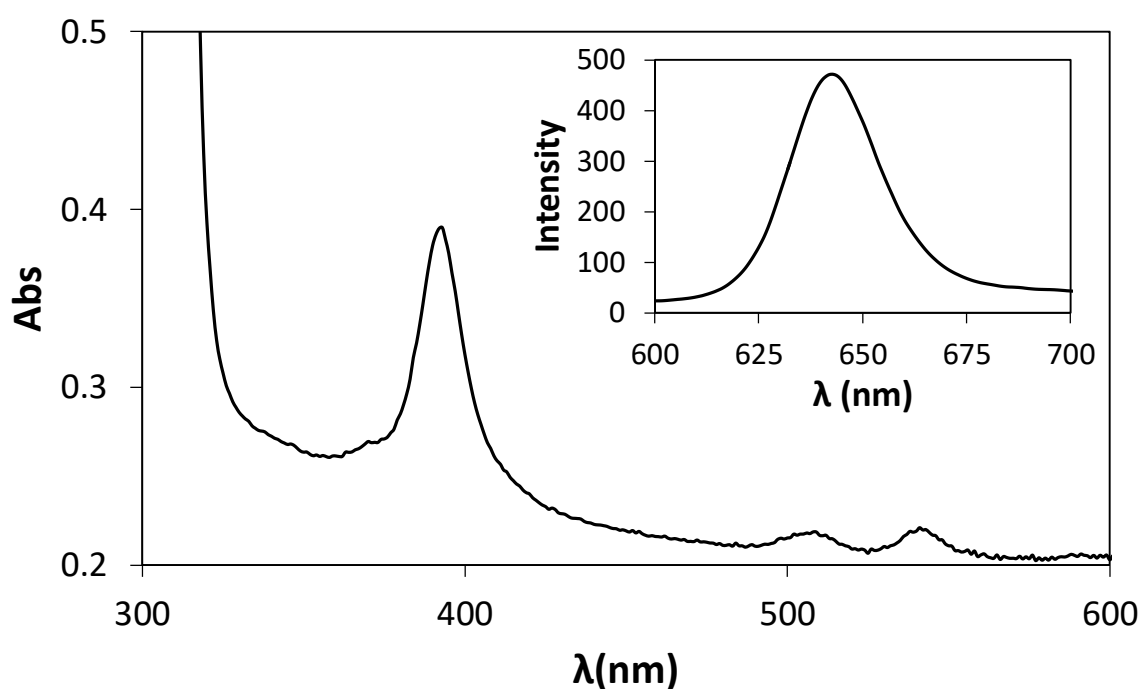
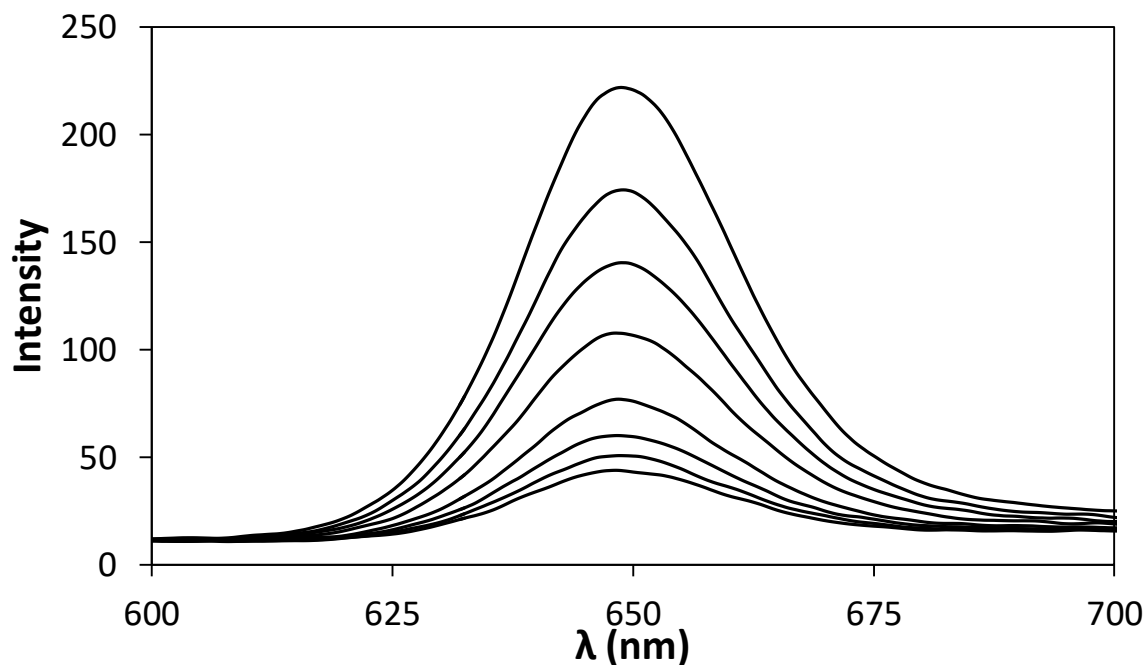


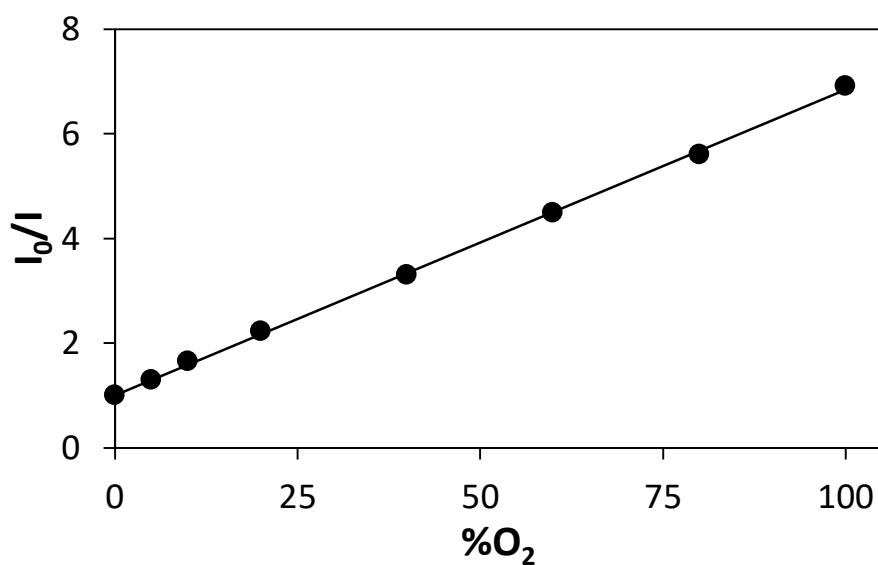
Figure S1.1: Typical absorbance spectra with insert emission spectra of the 3D printed PtTFPP/SiO<sub>2</sub>/LDPE dot.

## S2: FOSPOR dot O<sub>2</sub> sensitivity characteristics

O<sub>2</sub>-sensitivity of the FOSPOR dot was measured upon excitation at 390 nm, purging with different Ar/O<sub>2</sub> mixes of gas, each with a defined %O<sub>2</sub>.



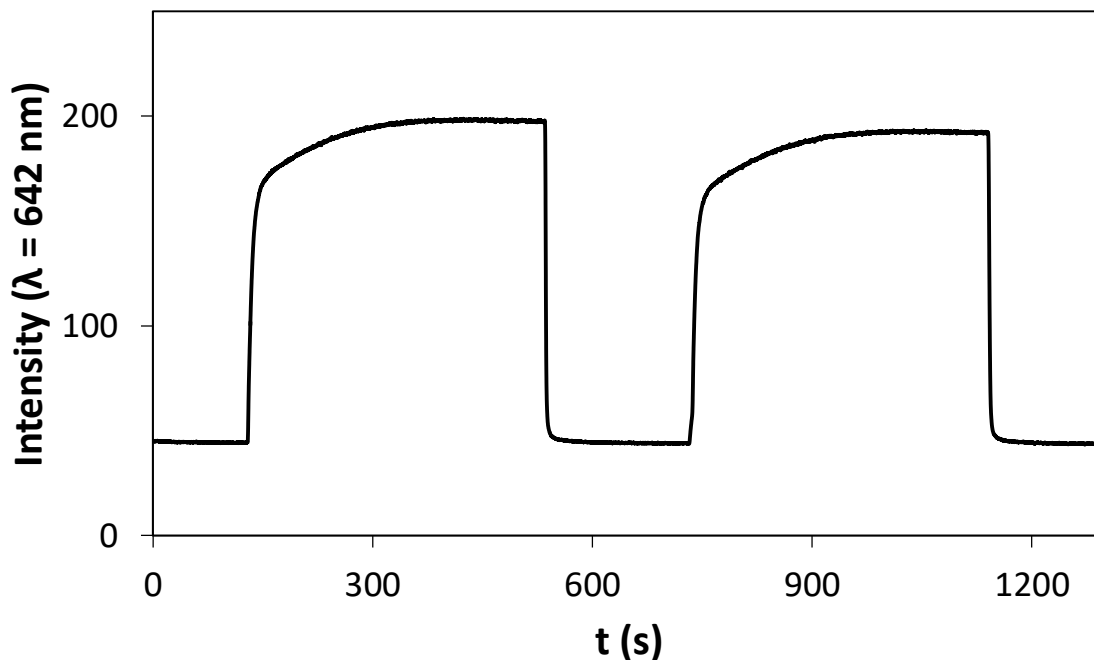
**Figure S2.1:** Emission spectra of FOSPOR dot upon exposure to (from top to bottom) 0, 5, 10, 20, 40, 60, 80, 100 % O<sub>2</sub>.



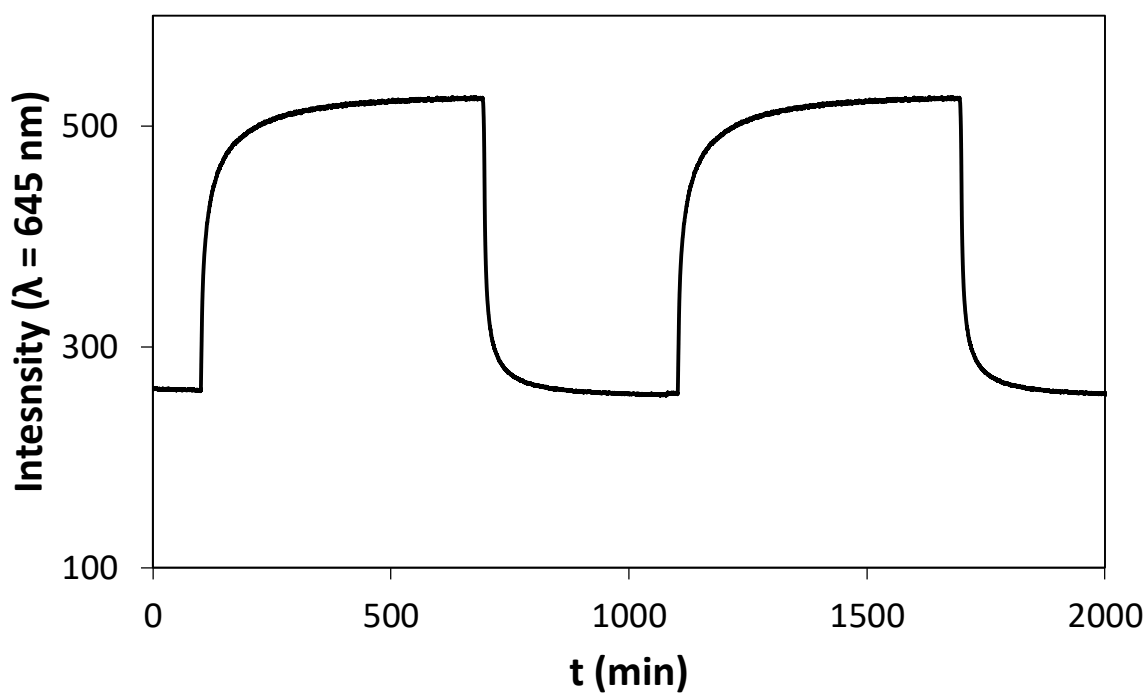
**Figure S2.2:** Stern - Volmer plot generated using the data in figure S2.1 above, from which values of  $K_{sv} = 0.0586 \pm 0.0007$  %O<sub>2</sub><sup>-1</sup> and PO<sub>2</sub> (S=1/2) = 17.1 %O<sub>2</sub> were calculated.

### S3: Response and recoveries

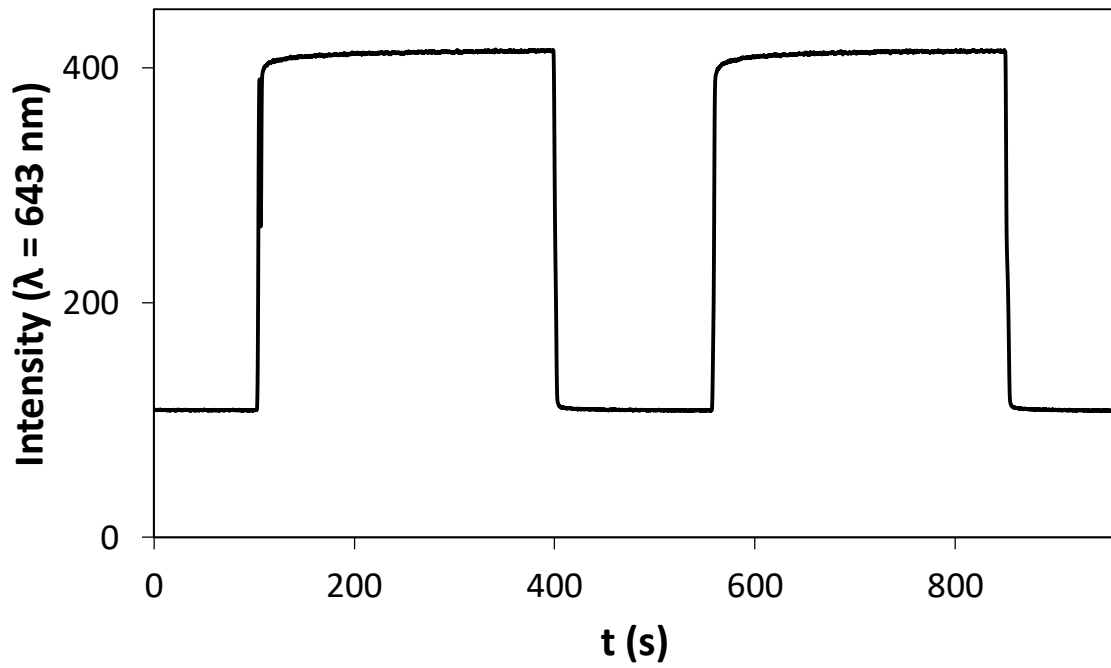
Repeated response and recovery were tested upon excitation at 390 nm and purging with alternative streams of pure argon and 100% oxygen.



**Figure S3.1:** Response and recovery plot of 3D printed PtTFPP/SiO<sub>2</sub>/LDPE dot. The 90% response and recovery times were calculated from the data above to be  $t_{\downarrow 90} = 3 \text{ s}$  and  $t_{\uparrow 90} = 75 \text{ s}$ .



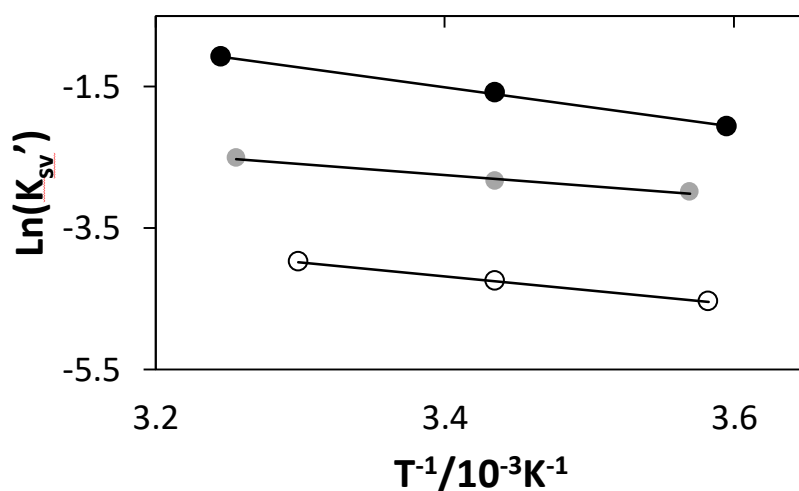
**Figure S3.2:** Response and recovery plot of 3D printed PtTFPP/SiO<sub>2</sub>/PLA dot. The 90% response and recovery times were calculated from the data above to be  $t_{\downarrow 90} = 41 \text{ s}$  and  $t_{\uparrow 90} = 118 \text{ s}$ .



**Figure S3.3:** Response and recovery plot of FOSPOR dot. The 90% response and recovery times were calculated from the data above to be  $t_{\downarrow 90} = 3$  s and  $t_{\uparrow 90} = 6$  s.

#### S4: Arrhenius plots

Temperature sensitivity was measured for each of the PtTFPP/SiO<sub>2</sub>/LDPE, PtTFPP/SiO<sub>2</sub>/PLA and FOSPOR O<sub>2</sub> indicators by recording the variation of fluorescence intensity as a function of %O<sub>2</sub>, at a series of different temperatures spanning the range 5 – 35 °C. The Stern-Volmer plots arising from this data generated a range of values of K<sub>sv</sub>' as a function of temperature, T. An Arrhenius plot of this data, *i.e.* ln(K<sub>sv</sub>') vs T, for each of the O<sub>2</sub> indicators each yielded a good straight line, from the gradient of which a value of the activation energy, -ΔH, associated with K<sub>sv</sub>' was calculated.



**Figure S4:** Ln(K<sub>sv</sub>') vs T<sup>-1</sup> plots of the 3D printed PtTFPP/SiO<sub>2</sub>/LDPE dot (black dot), 3D printed PtTFPP/SiO<sub>2</sub>/PLA dot (open circle), and the FOSPOR dot (grey dot). From which -ΔH value of 23.3 ± 0.8 kJ mol<sup>-1</sup>, 16.5 ± 0.3 kJ mol<sup>-1</sup>, and 13.1 ± 1.5 kJ mol<sup>-1</sup> can be calculated respectively.