Electronic supplementary information

Facile Approaches to built Ordered Amphiphilic Tris(phthalocyaninato) Europium Triple-Decker Complex Thin Films and their comparative performances as the ozone sensor

Yanli Chen, Marcel Bouvet*, Thibaut Sizum, Yingning Gao, Cedric Plassard, Eric Lesniewska and Jianzhuang Jiang*

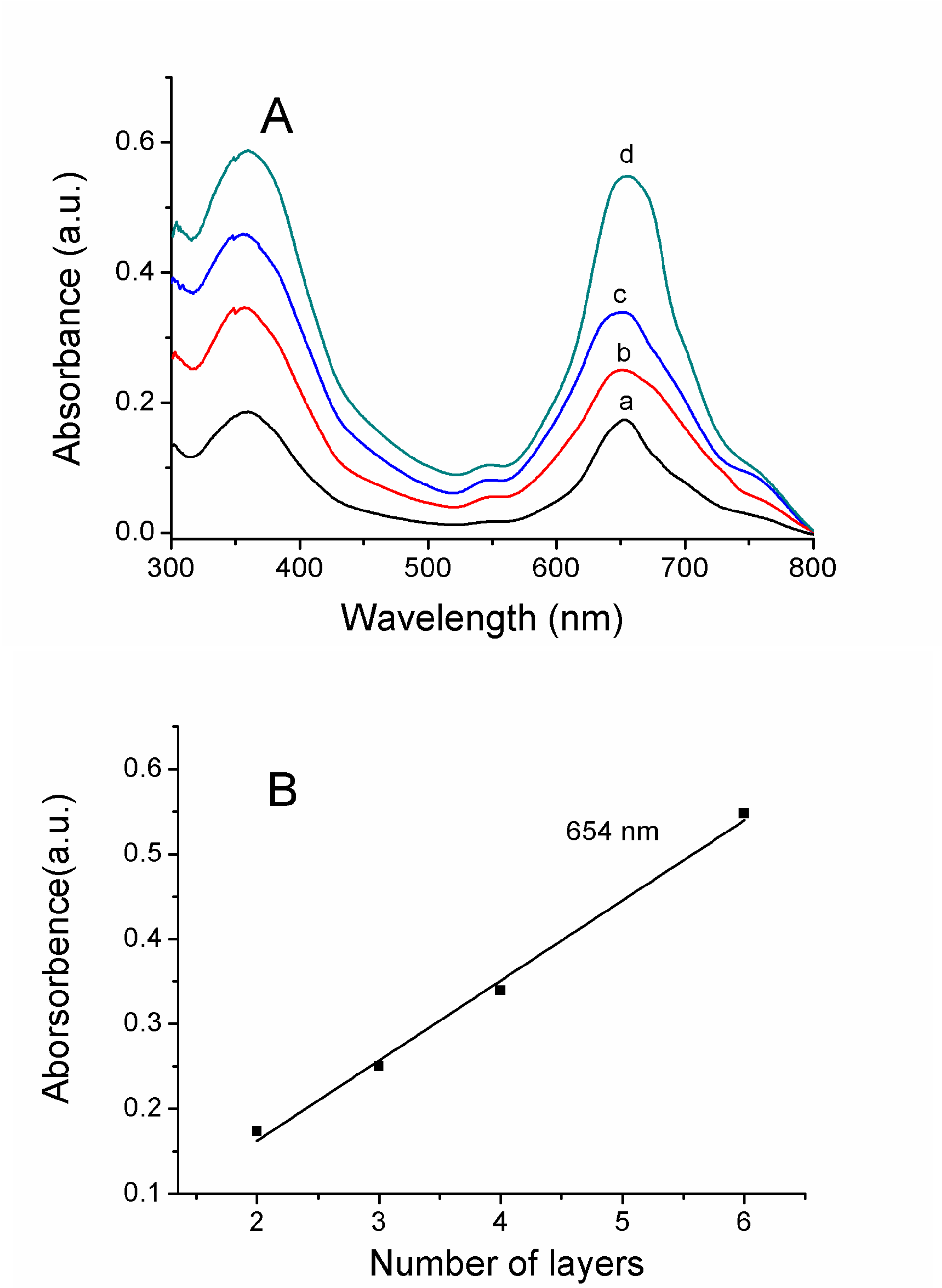

Fig. S1 (**A**) UV-vis spectra of QLS $Eu_2[Pc(15C5)_4]_2[Pc(OC_{10}H_{21})_8]$ films (a-d), (a: 2 layers; b: 3 layers; c: 4 layers; d: 6 layers). (**B**) The relationship between the absorption intensity at 654 nm and the number of layers.

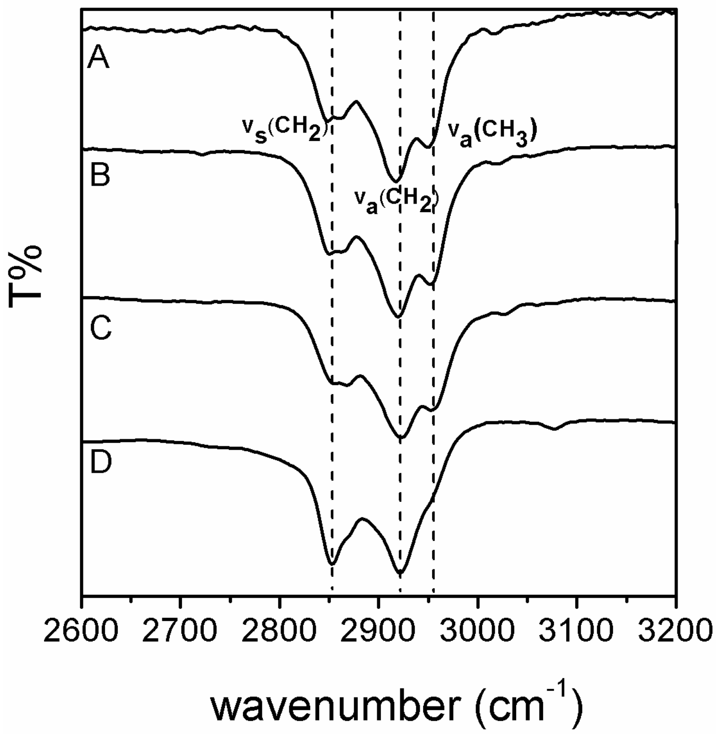

Fig. S2 FTIR in ATR mode spectra of (A) SA films; (B) QLS films; (C) cast films and (D) bulk $Eu_2[Pc(15C5)_4]_2[Pc(OC_{10}H_{21})_8]$ adsorbed at ITO/glass substrates in the region of 2600-3200 cm^{-1} with 2 cm^{-1} resolution.

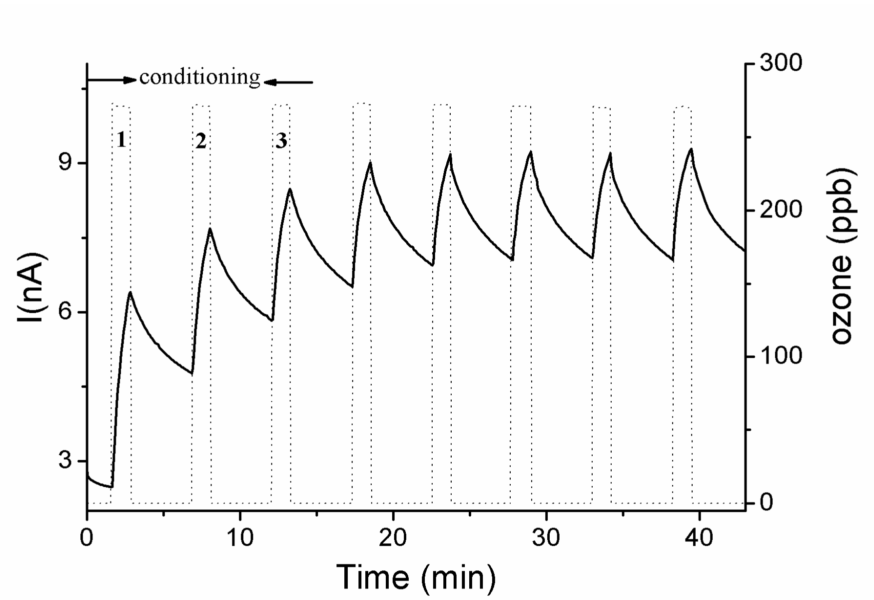

Fig. S3. Alternation of exposure and static recovery periods showing the conditioning stage(cycles 1–3) which is a prerequisite to obtain reproducible measurements of cast $Eu_2[Pc(15C5)_4]_2[Pc(OC_{10}H_{21})_8]$ films.(similar situation took place for another two types of films and have been omitted for clarity). Dotted line: concentration of ozone.

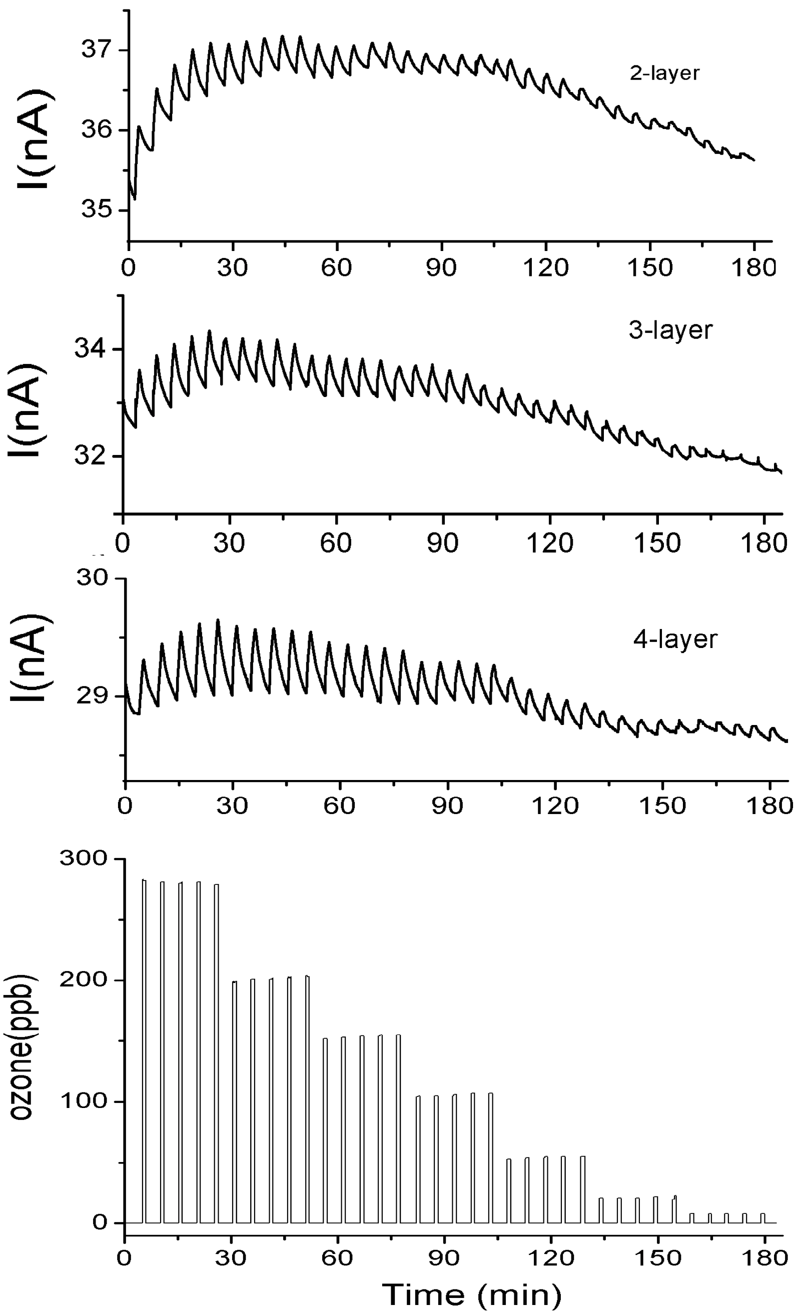

Fig. S4 The time-denpendent current plots for 2-4 layers of QLS $Eu_2[Pc(15C5)_4]_2[Pc(OC_{10}H_{21})_8]$ films exposed to O_3 at varied concentration in the range of 0-300 ppb(exposure:1min, recovery: 4 min), while the bottom rectangular pulses represent the O_3 concentration as a function of time.

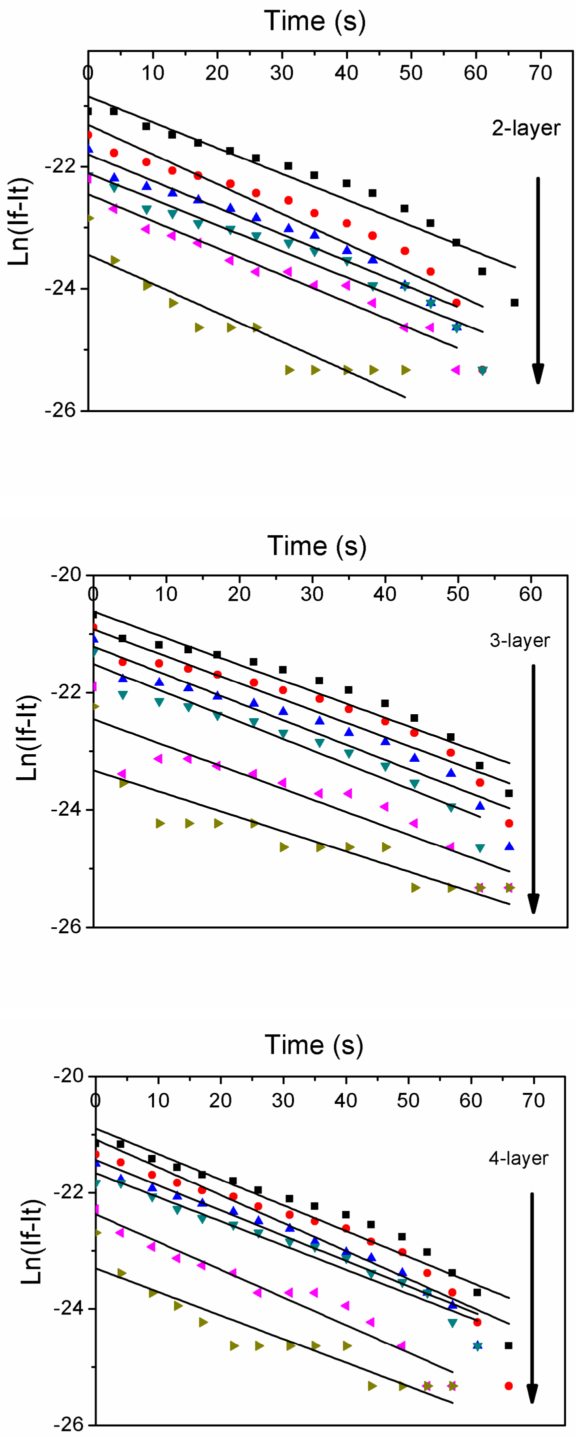

Fig. S5 The kinetics plots of 2-4 layers of QLS $Eu_2[Pc(15C5)_4]_2[Pc(OC_{10}H_{21})_8]$ films: $\ln(I_f - I_t)$ versus time is predominantly linear for different concentration of O_3, suggesting first-order kinetics. Arrows indicate the direction of change with decreasing concentration of ozone.

Table S1. Characteristics of electrical conductivity and gas sensing behavior from three types of $Eu_2[Pc(15C5)_4]_2[Pc(OC_{10}H_{21})_8]$ films at room temperature.

Type of films	film-thickness (nm)	electrical conductivity($S\cdot cm^{-1}$)[a]	Sensor response (% ppb^{-1})	Average sensor response rate constant (s^{-1})
SA films	4.6 [b]	~more than 10^{-4} [c]	0.0376	0.0498
QLS films	4.42~13.26[d]	~10^{-5}	0.0267[e]	0.0574
Cast films	92	~10^{-6} [f]	0.0721	0.0486

[a] Calculated by Eq: (1) in experimental section

[b] Thickness was obtained by AFM measurement.

[c] Electrical conductivity was calculated with an estimated channel coverage less than 50% .

[d] Thickness was deduced from the value of layer spacing obtained by XRD and the number of layers in a 2-6 layers range.

[e] Calculated for 6-layer QLS films

[f] The thickness of electrode of 20nm is preferred since the thickness of cast films calculated is ca. 92nm.