Electronic Supplementary Information

Synthesis and characterization of novel electrochromic poly(amide-imide)s with *N,N'*-di(4-methoxyphenyl)-*N,N'*-diphenyl-*p*-phenylenediamine units

Sheng-Huei Hsiao,*[a] Chia-Yin Teng,[a] Yu-Ruei Kung,[b]

[a]*Department of Chemical Engineering and Biotechnology, National Taipei University of Technology, Taipei 10608, Taiwan. Correspondence to: S.-H. Hsiao (E-mail: shhsiao@ntut.edu.tw)*

[b]*Div. of Organic Opto-electronic Materials and Applications,Material and Chemical Laboratories, Industrial Technology Research Institute, Hsinchu 31040, Taiwan.*

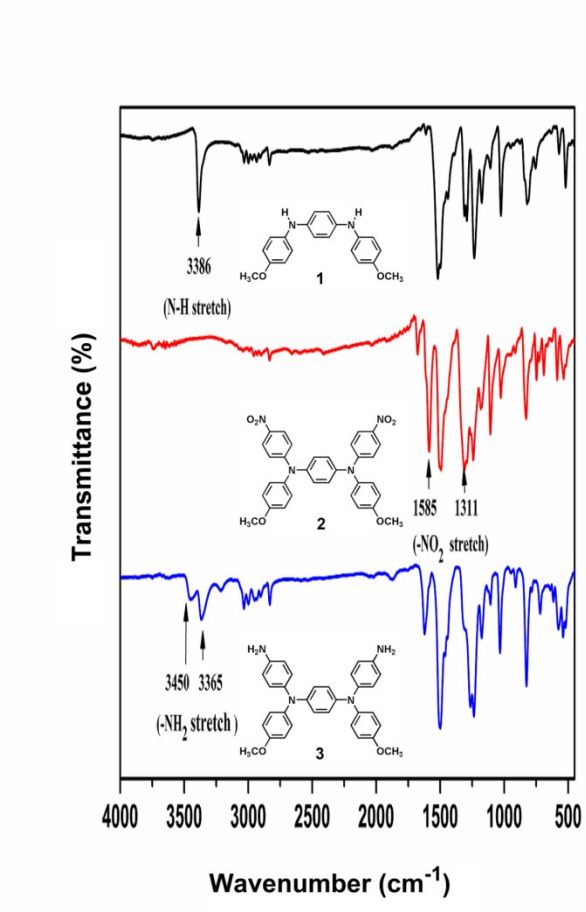

Fig. S1 IR spectra of synthesized compounds **1**−**3**.

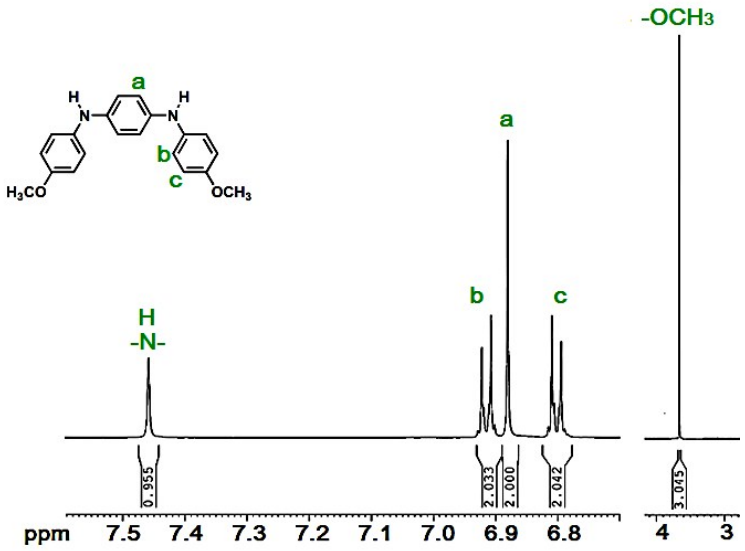

Fig. S2 The ^{1}H-NMR spectrum of compound **1** in DMSO-d_6.

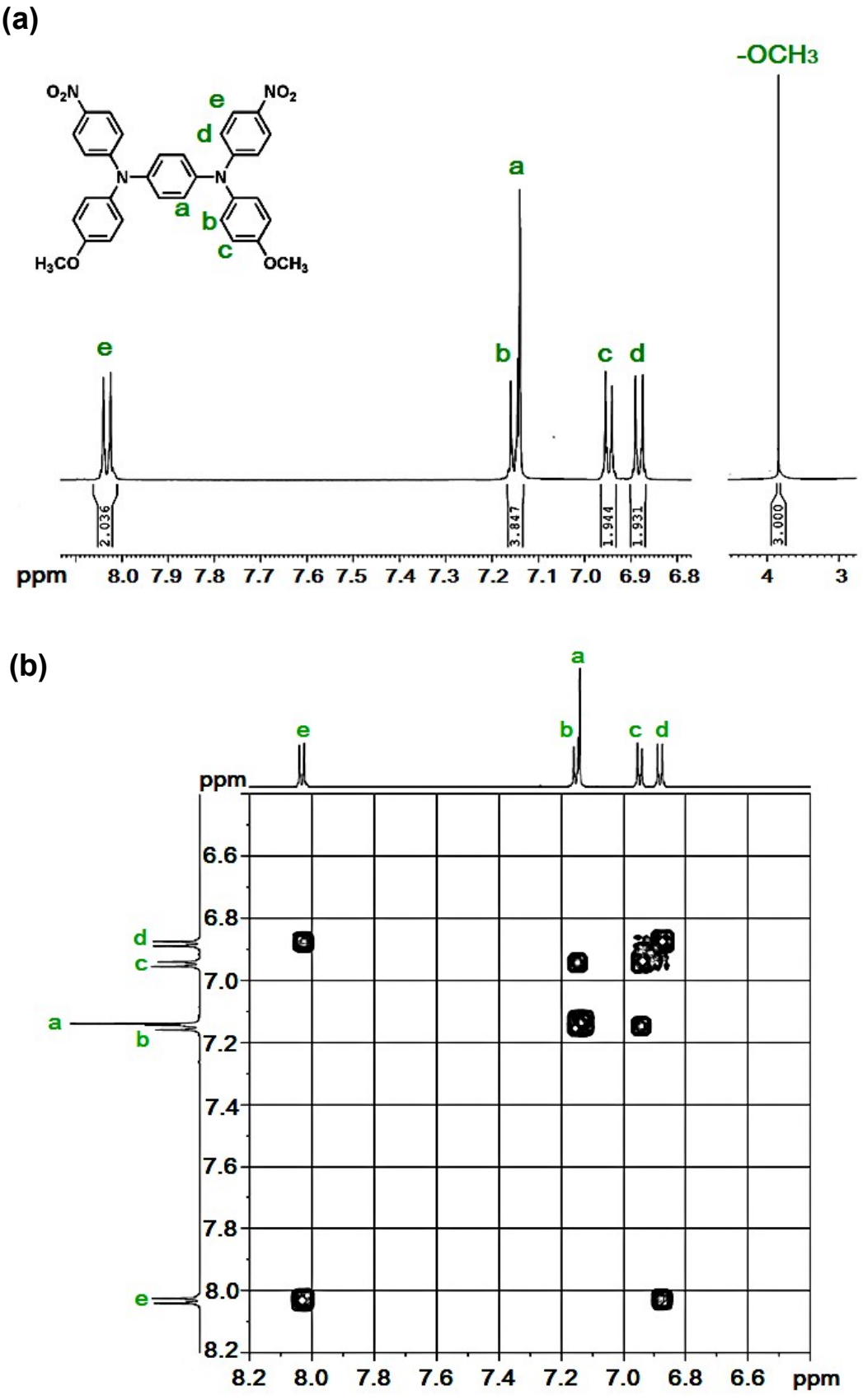

Fig. S3 (a) ^{1}H and (b) H-H COSY NMR spectra of dinitro compound **2** in $CDCl_3$.

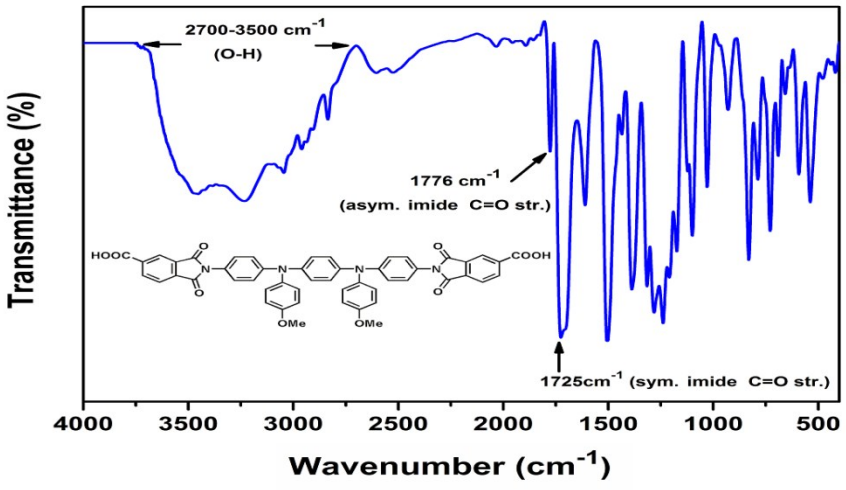

Fig. S4 The IR spectrum of diimide-diacid monomer **4**.

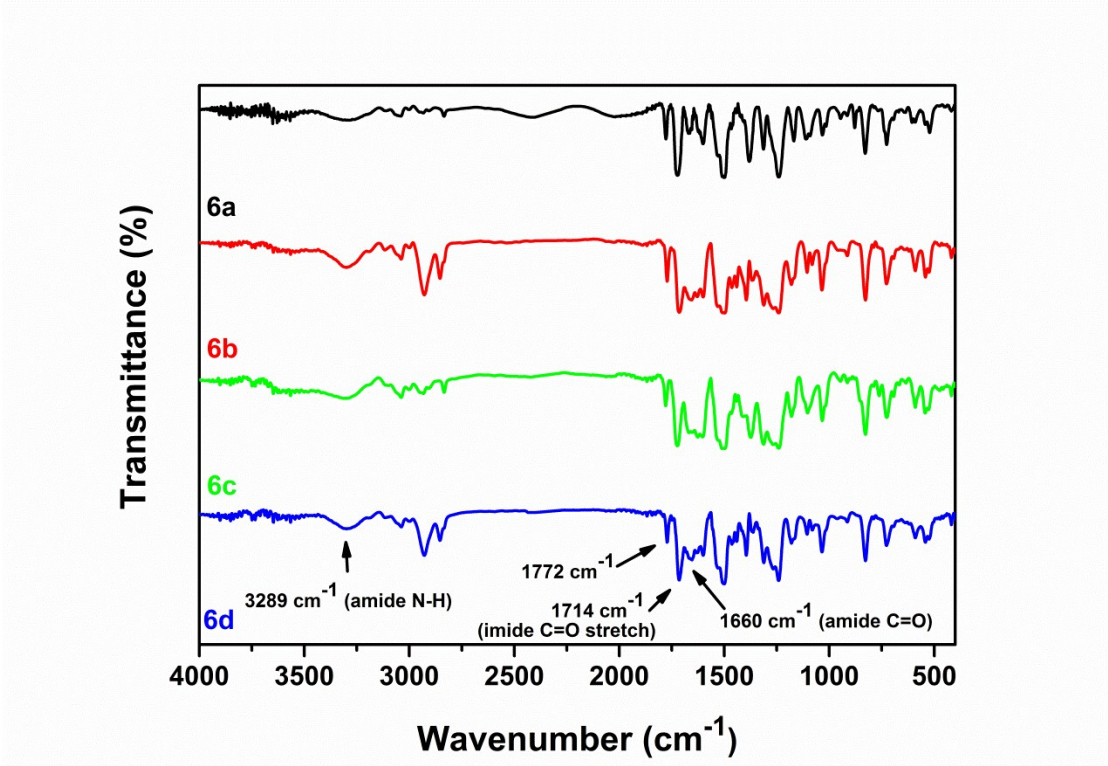

Fig. S5 IR spectra of PAIs **6a−6d**.

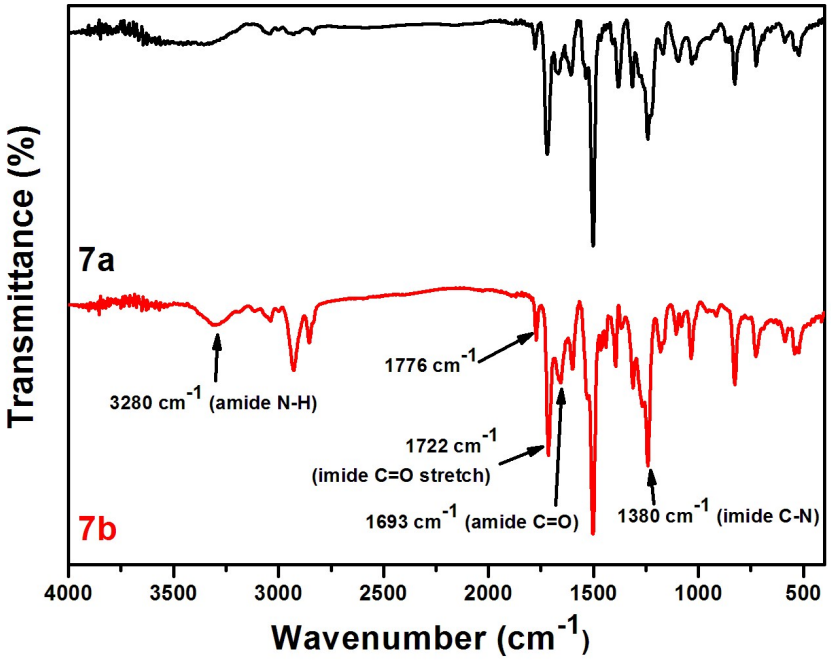

Fig. S6 IR spectra of PAIs **7a** and **7b**.

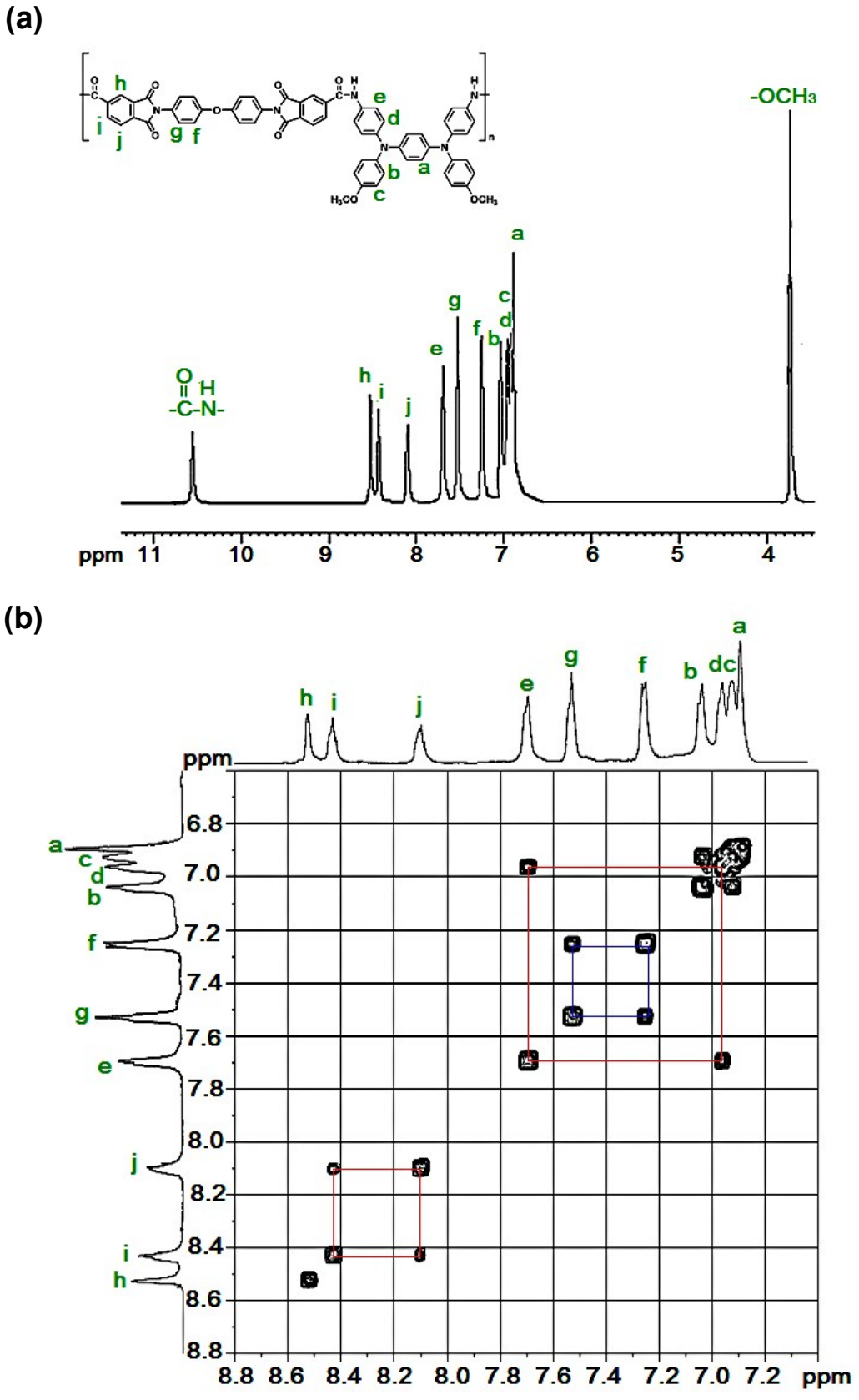

Fig. S7 (a) ^{1}H and (b) H-H COSY NMR spectra of PAI **6a** in DMSO-d_6.

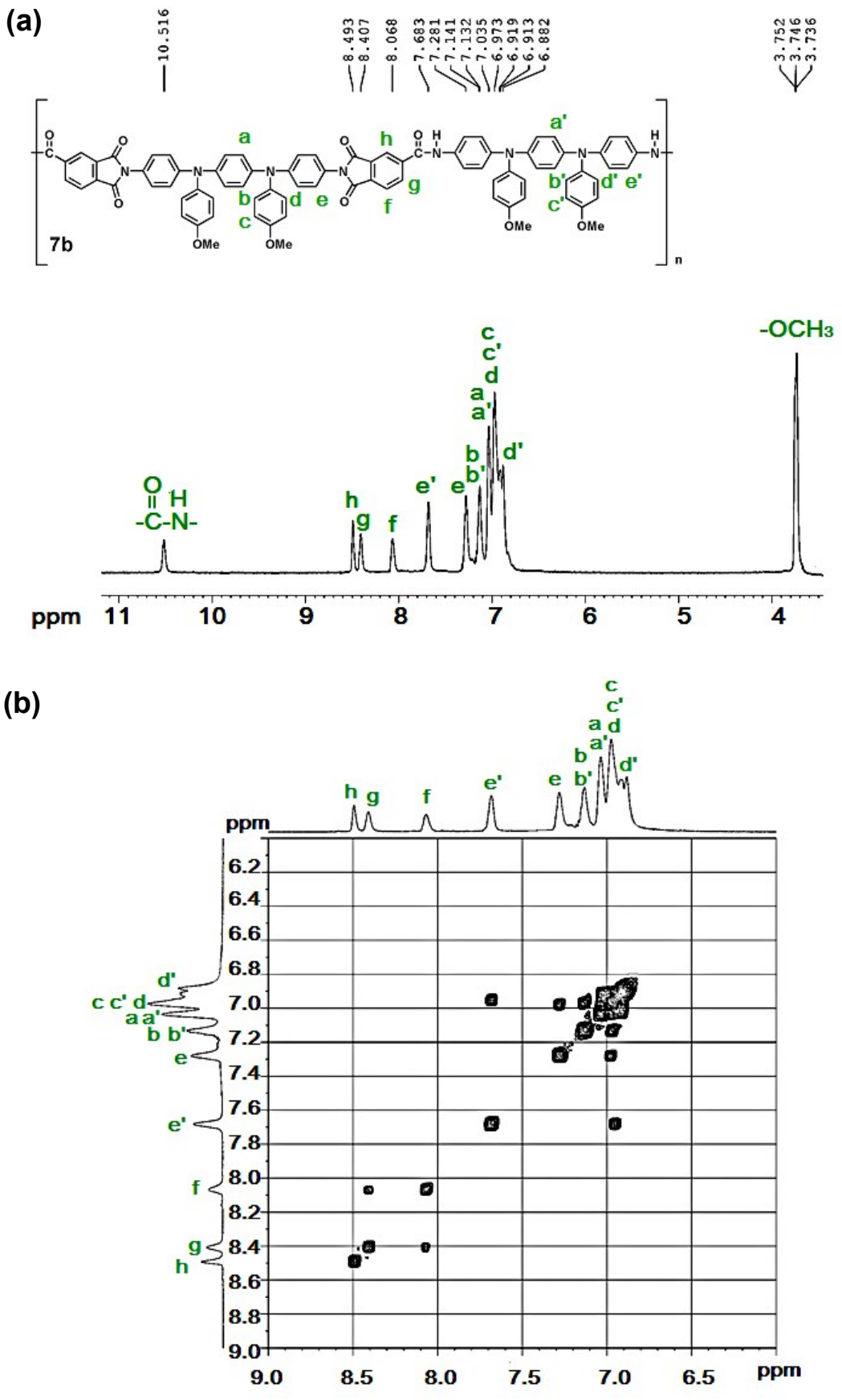

Fig. S8 (a) ^{1}H and (b) H-H COSY NMR spectra of PAI **7b** in DMSO-d_6.

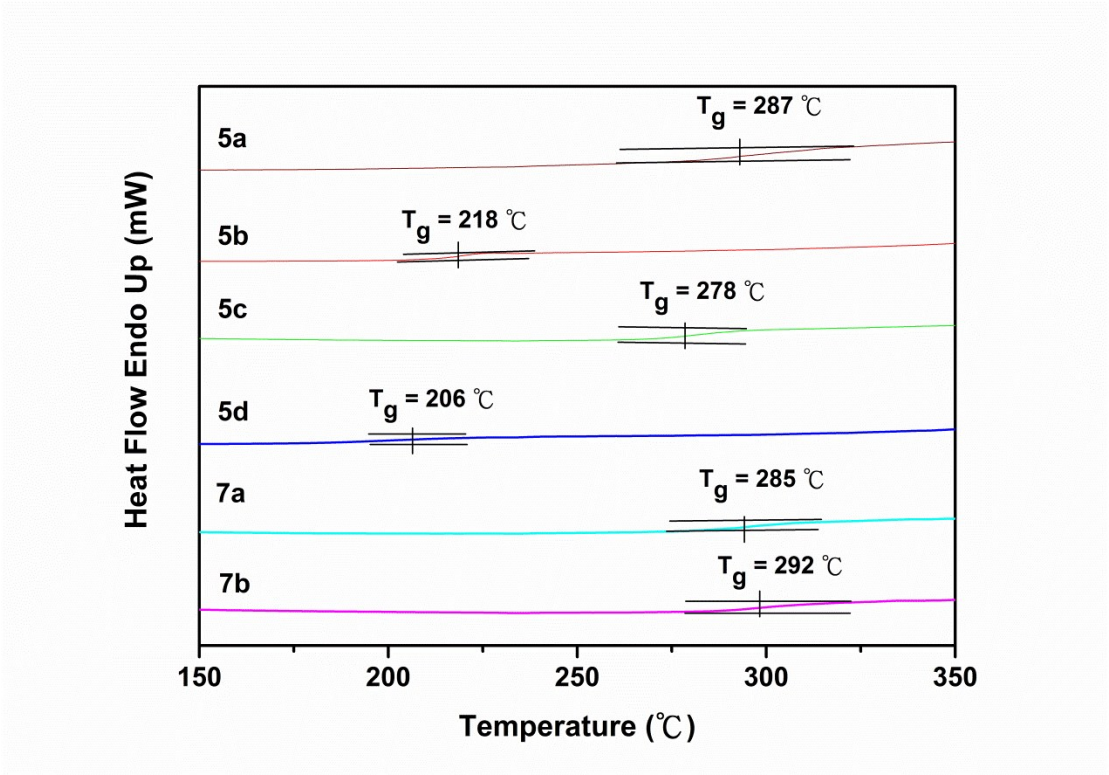

Fig. S9 DSC curves (the second scans after quenching from 400 °C) of all the PAIs with a heating rate of 20 °C min^{-1}.

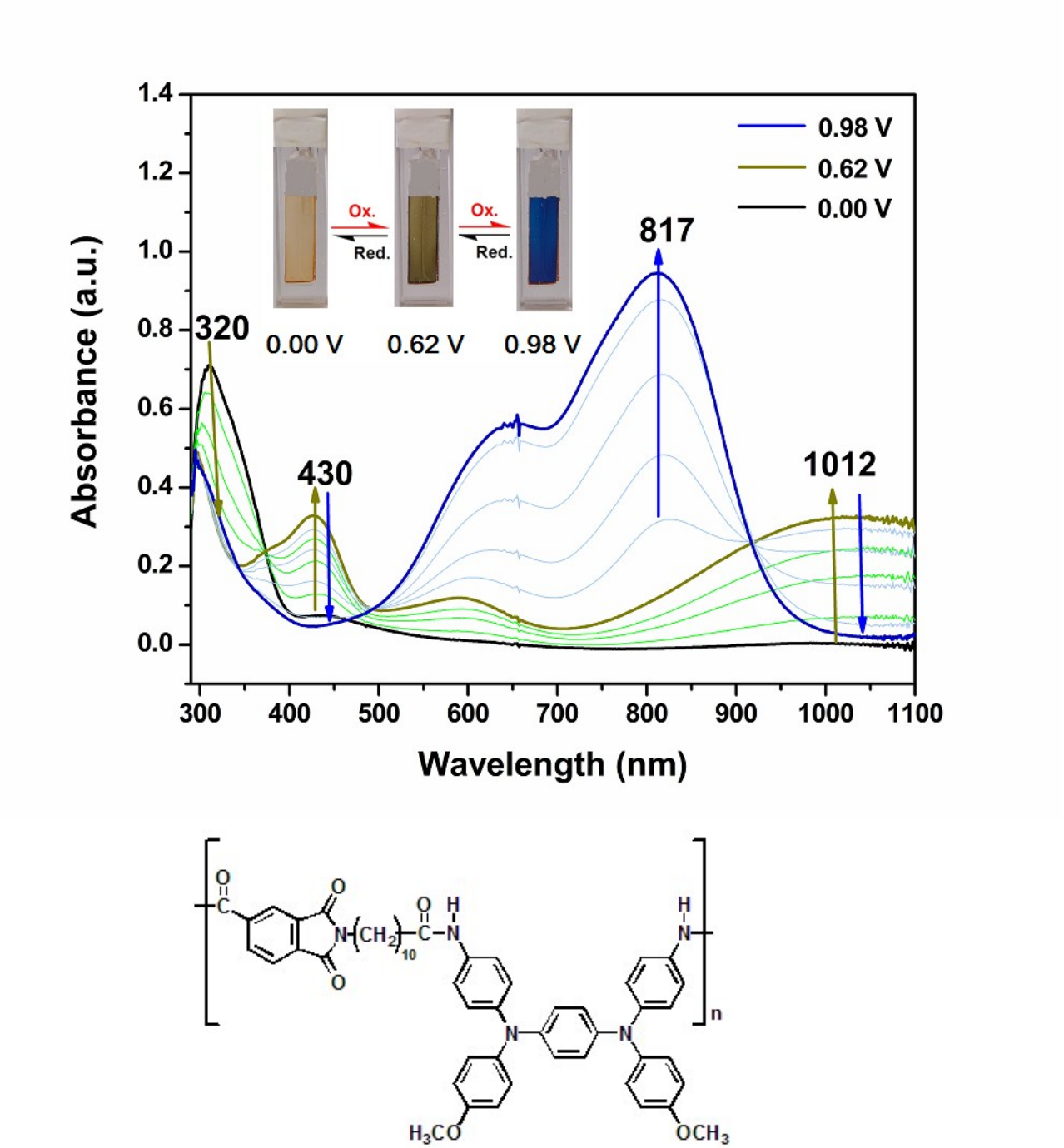

Fig. S10. Spectroelectrograms and color changes of **6d** thin film (190 ± 30 nm in thickness) on the ITO-coated glass substrate in 0.1 M Bu_4NClO_4/CH_3CN at applied potentials of 0, 0.35, 0.45, 0.55, 0.65, 0.80, 0.85, 0.90, 0.95, and 0.98 V (vs Ag/AgCl) (Inset: polymer film with about 1.6 μm in thickness).

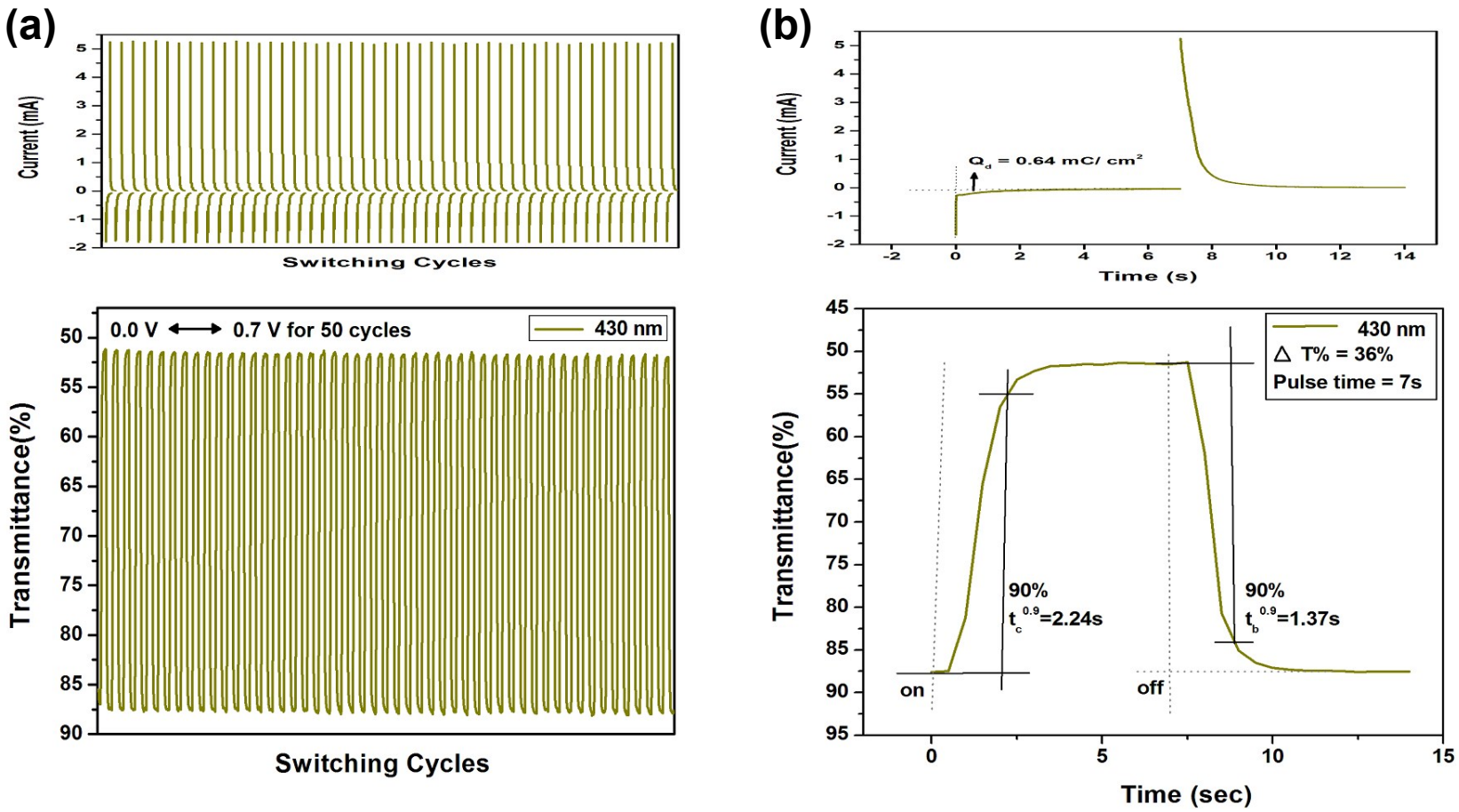

Fig. S11 Potential step absorptiometry of the cast films of **6d** on the ITO-glass slide (coated area ~ 1 cm^2) (in CH_3CN with 0.1 M Bu_4NClO_4 as the supporting electrolyte) by applying a potential step: (a) optical switching at potential 0.00 V ⇔ 0.70 V (50 cycles) and a switching time of 7 s, monitored at λ_{max} = 430 nm; (b) the 1st cycle transmittance change for the **6d** thin film.

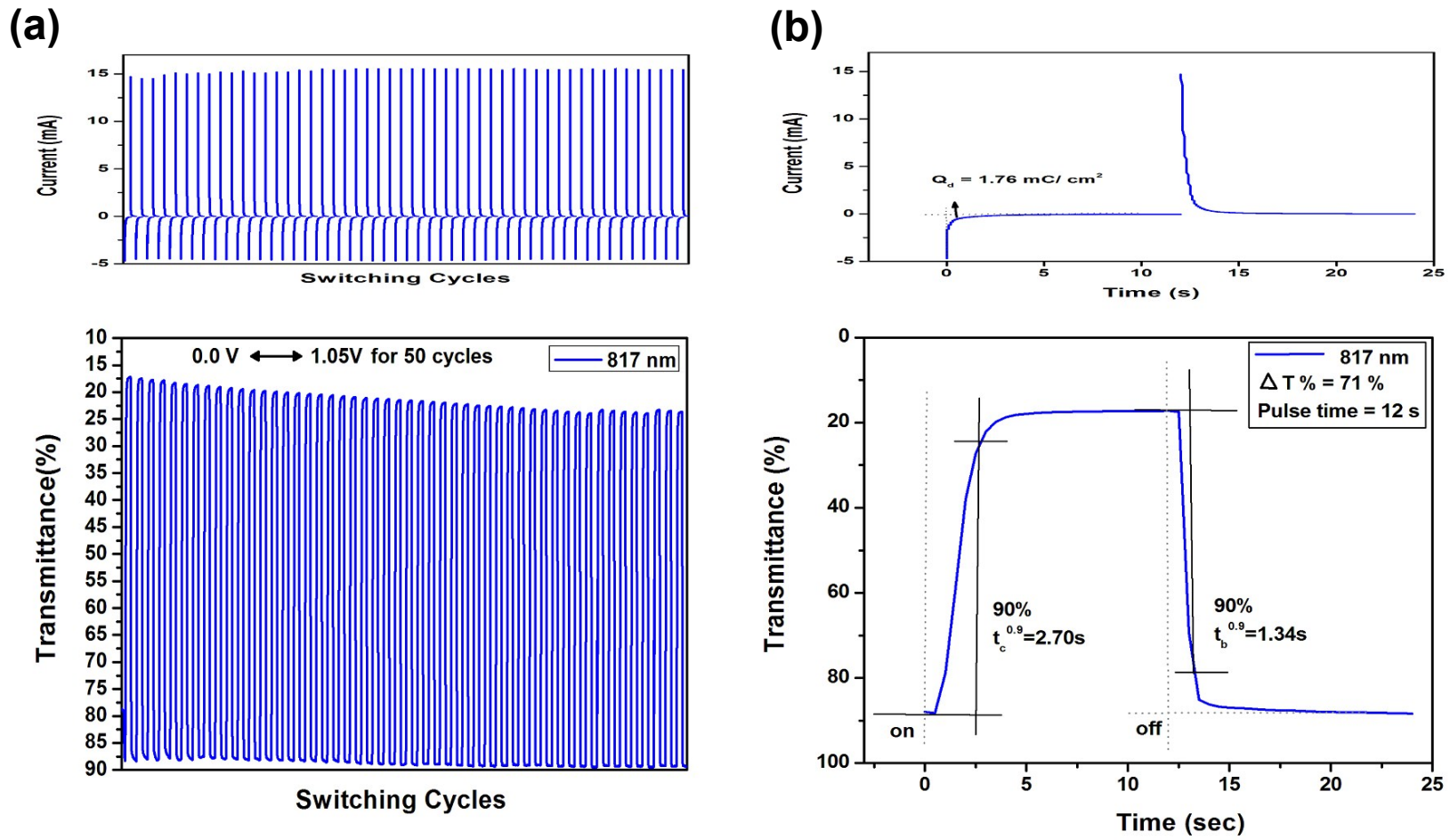

Fig. S12. Potential step absorptiometry of the cast films of **6d** on the ITO-glass slide (coated area ~ 1 cm^2) (in CH_3CN with 0.1 M Bu_4NClO_4 as the supporting electrolyte) by applying a potential step: (a) optical switching at potential 0.00 V ⇔ 1.05 V (50 cycles) and a switching time of 12 s, monitored at λ_{max} = 817 nm; (b) the 1st cycle transmittance change for the **6d** thin film.

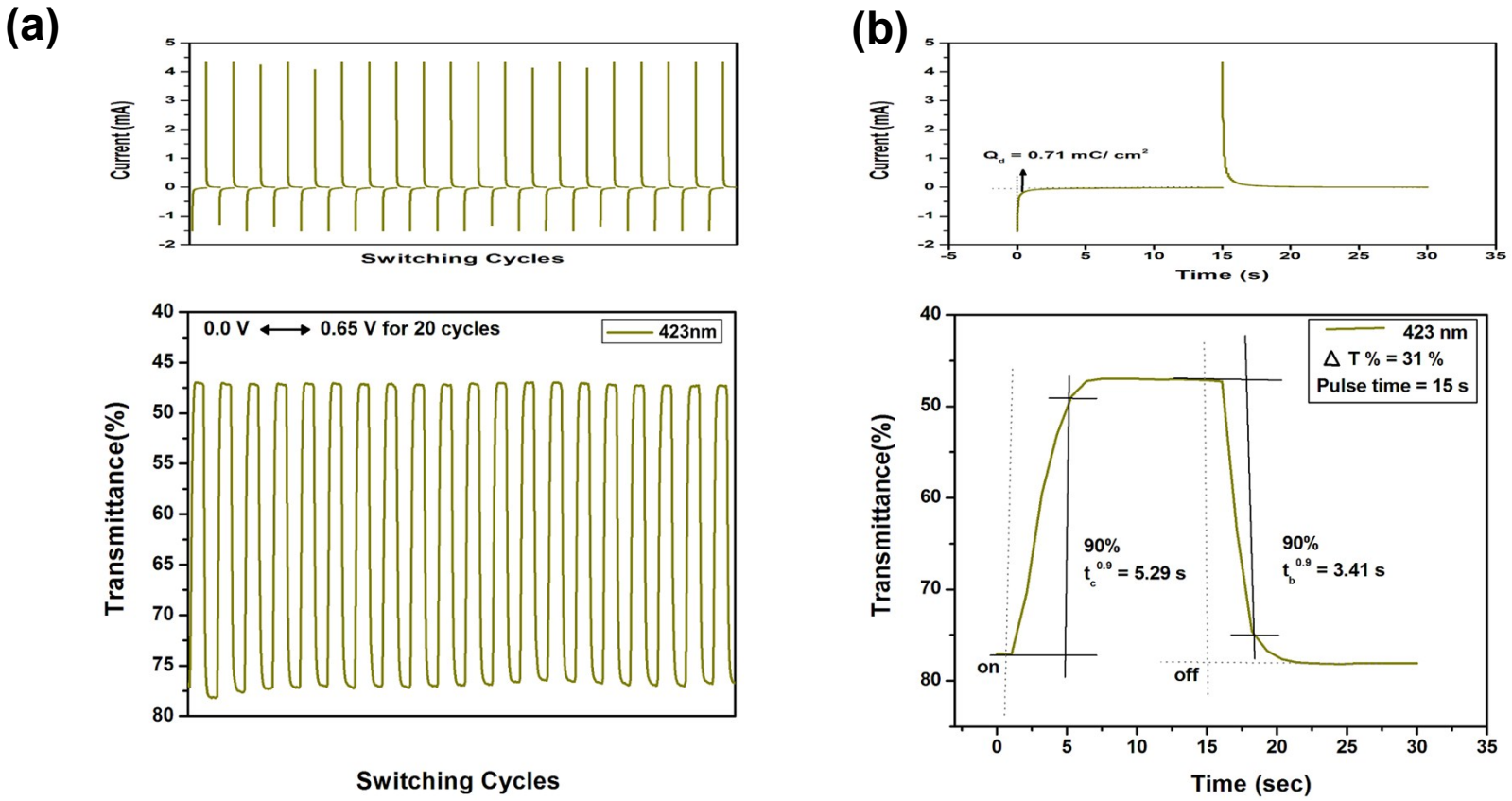

Fig. S13. Potential step absorptiometry of the cast film of **7b** on the ITO-glass slide (coated area ~ 1 cm^2) (in CH_3CN with 0.1 M Bu_4NClO_4 as the supporting electrolyte) by applying a potential step: (a) optical switching at potential 0.00 V ⇔ 0.65 V (20 cycles) and a switching time of 15 s, monitored at λ_{max} = 423 nm; (b) the 1st cycle transmittance change for the **7b** thin film.

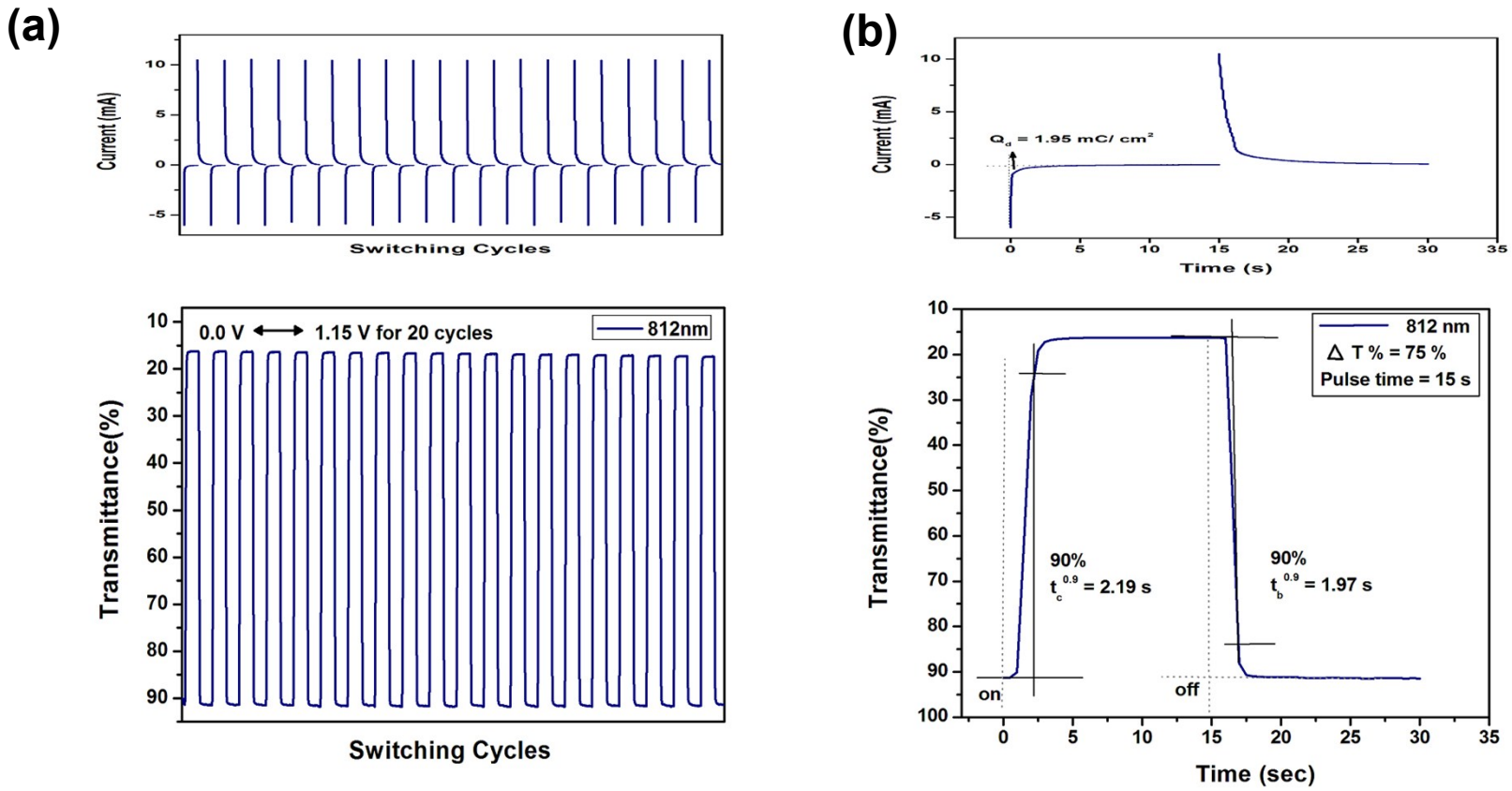

Fig. S14. Potential step absorptiometry of the cast film of **7b** on the ITO-glass slide (coated area ~ 1 cm^2) (in CH_3CN with 0.1 M Bu_4NClO_4 as the supporting electrolyte) by applying a potential step: (a) optical switching at potential 0.00 V ⇔ 1.15 V (20 cycles) and a switching time of 15 s, monitored at λ_{max} = 812 nm; (b) the 1st cycle transmittance change for the **7b** thin film.