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ARTICLE TYPE

A New Organo–inorganic Hybrid of Poly(cyclotriphosphazene–4,4'-bipyridinium) chloride with a Large Electrochromic Contrast

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Supporting Information

General: IR spectra were recorded on a Bruker
Tensor 37 (FTIR) spectrophotometer. ¹H NMR
spectra were recorded on a Bruker Avance 400

10 (400 MHz) spectrometer at 295 K in CDCl₃ or
DMSO-d₆; chemical shifts (δ ppm) are reported

in standard fashion with reference to either
internal standard tetramethylsilane (TMS) ($\delta_{\text{H}} =$
0.00 ppm) or CHCl₃ ($\delta_{\text{H}} = 7.25$ ppm) or

15 DMSO($\delta_{\text{H}} = 2.49$ ppm). ¹³C NMR spectra were
recorded on a Bruker Avance 400 (100 MHz)
spectrometer at RT in DMSO-d₆; chemical shifts
(δ ppm) are reported relative to DMSO-d₆ [$\delta_{\text{C}} =$

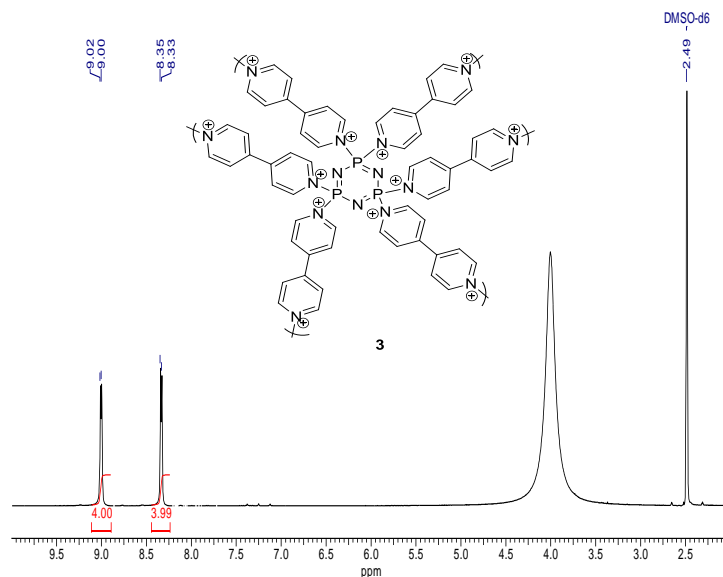
39.45 ppm (central line). In the ¹H-NMR, the

20 following abbreviations were used throughout: s

= singlet, d = doublet, t = triplet, q = quartet.

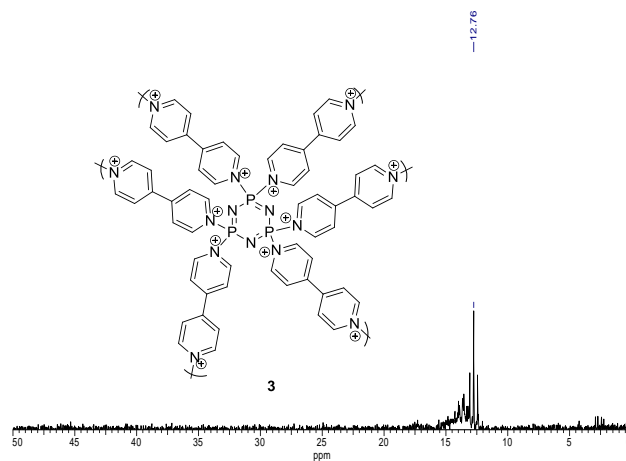
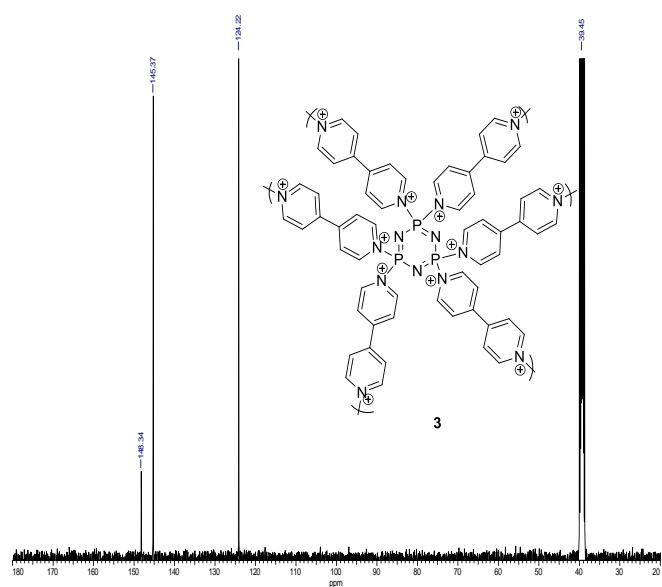
High-resolution mass spectra (HR-MS) for

material PPBP (3) were recorded using
Shimadzu Biotech AXIMA Performance (25
MALDI/TOF).



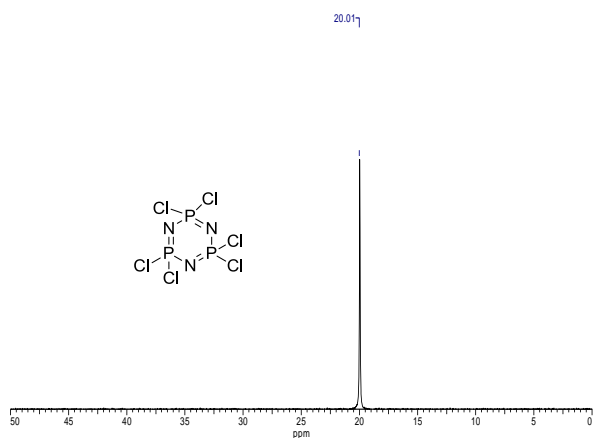
¹H NMR (400 MHz) spectrum of 2 in DMSO-d₆

30

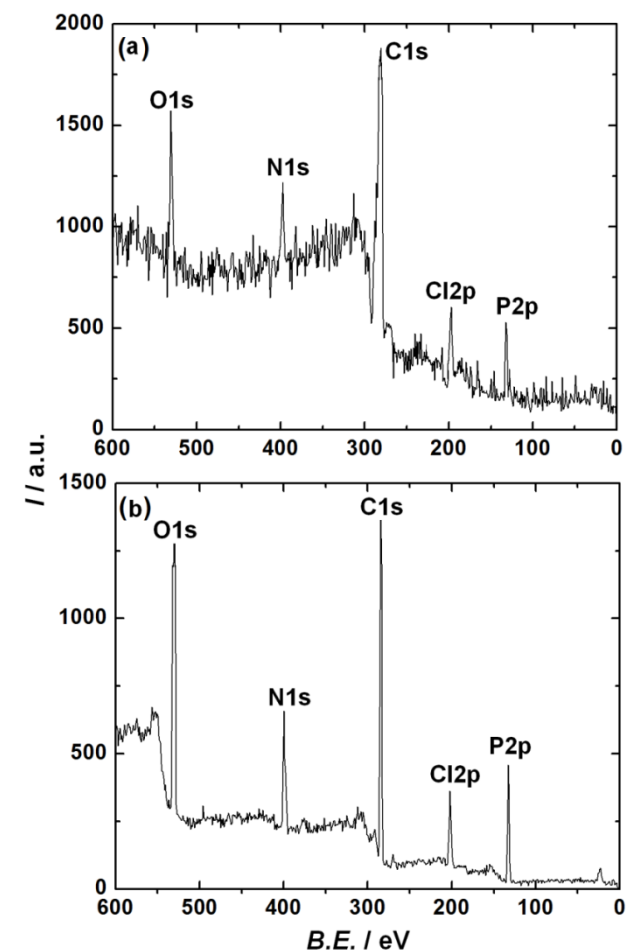


¹³C NMR (100 MHz) spectrum of PPBP (**3**) in DMSO-d₆

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³¹P NMR (162 MHz) spectrum of **3** in DMSO-d₆



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Figure S1 XPS survey spectra of (PNCl₂)₃ trimer and PPBP material.

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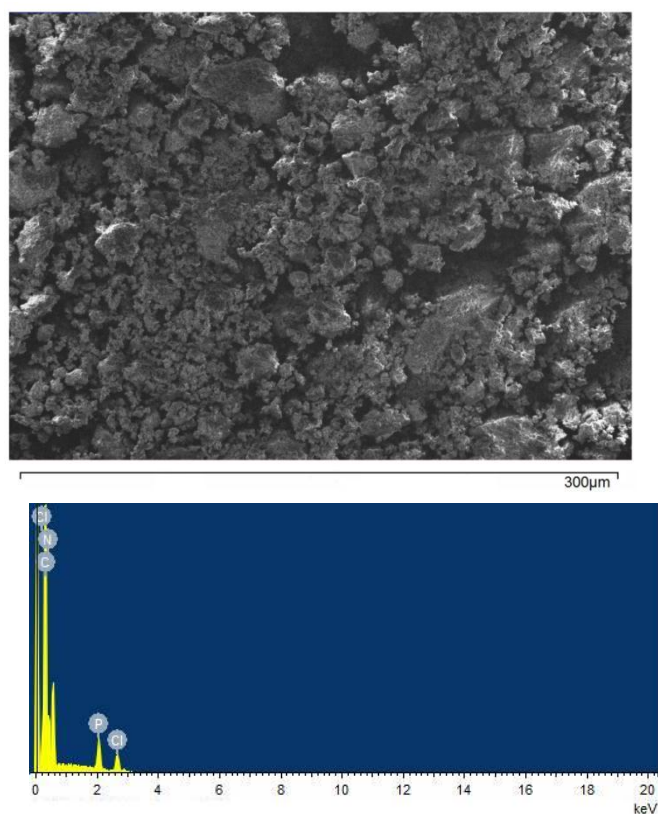
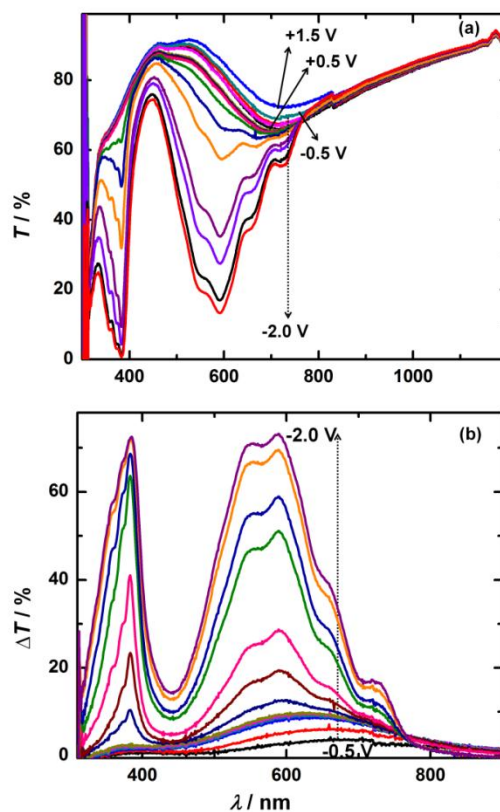


Figure S2 SEM micrograph and the corresponding EDX plot of the PPBP solid.



10 Figure S4 (a) The *in-situ* transmittance spectra of PPBP-PB device recorded under different dc reduction potentials (applied to the blank FTO electrode) in the range of -0.5 to -2.0 V and under different oxidation potentials of $+0.5$, $+1.0$ and $+1.5$ V and (b) the corresponding transmission modulation (ΔT) plots are shown. The device was subjected to negative potentials starting from -0.5 V and in steps of 0.2 V upto -1.1 V and then in steps of 0.1 V upto -2.0 V. The maximum transmission modulation ΔT_{\max} ($\Delta T = T_{\text{bleach}}(+1.5 \text{ V}) - T_{\text{col}}$), T_{bleach} at $+1.5$ V and T_{col} at -0.5 to -2 V;) offered by the device was 70.5% at λ_{\max} of 590 nm by using T_{col} at -2 V and it was 68.9% at 550 nm. The transmittance data recorded under $+1.5$ V was used as reference for all ΔT plots.

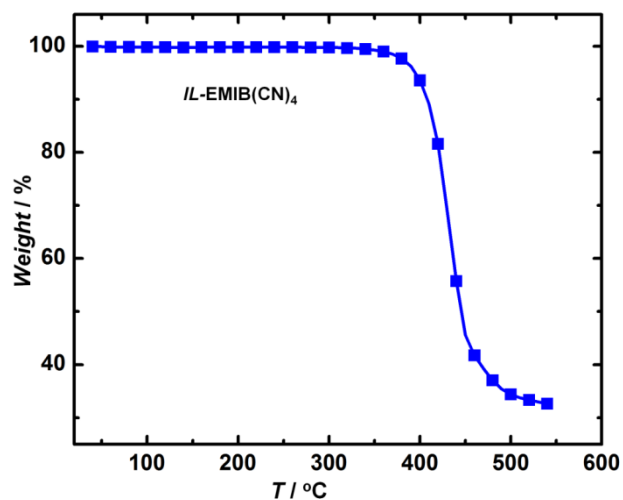


Figure S3 TGA of neat IL ($\text{EMIB}(\text{CN})_4$) recorded in the 30 – 600 °C temperature range under N_2 .

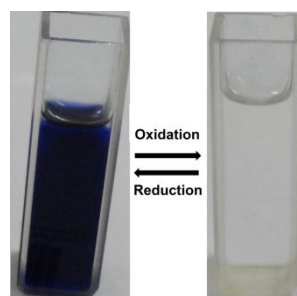


Figure S5 The ability of the PPBP salt to form radical cations by chemical reduction by using Zn powder and a deep blue color was obtained in solution phase.

⁵ Table S1 Electrochemical impedance spectroscopy results for PPBP-PB device, obtained by fitting the experimental data in the models shown in Figure 8.

Applied E / V	R_{CT} / Ω	C_{dl} / μF	Y_o / μS
0	390	0.52	–
+0.5	300	0.54	–
+1.0	121	0.56	–
+1.5	44	0.48	–
–0.5	157	1.42	193
–1.0	31	0.68	201
–1.5	14	0.22	2360
–2.0	3.5	1.4	3030
