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Supplementary Information

A possible channel effect of the organics adsorbed to the electrode surface on interfacial electron transfer in alkaline Pb electrodeposition process

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Key words: electron transfer; channel; molecular-bridge; π -bond system; electrodeposition; additive

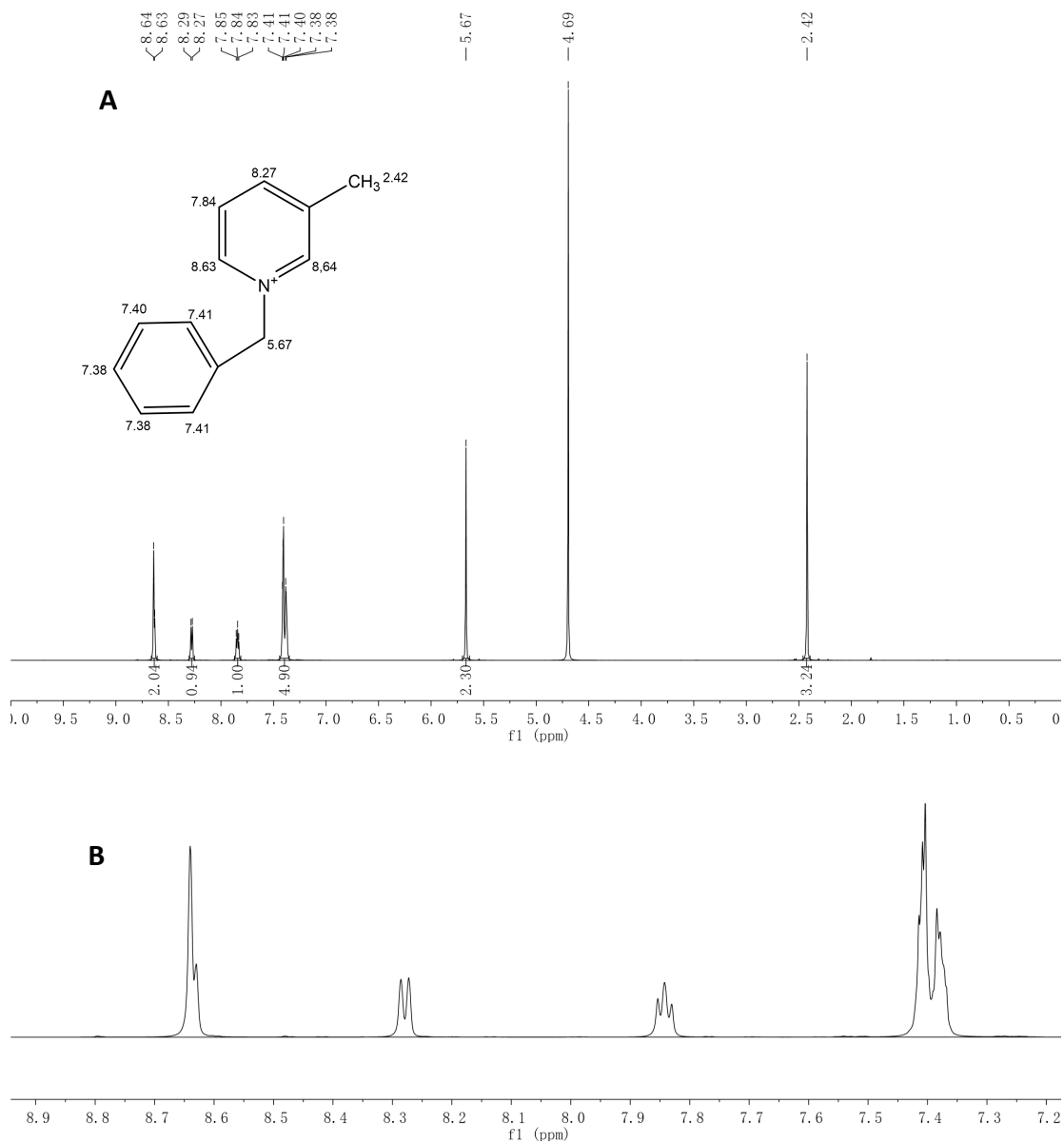


Figure S1. (A) $^1\text{H-NMR}$ of BMP and (B) the amplification of coupling peaks moiety in $^1\text{H-NMR}$ of BMP

600 MHz $^1\text{H-NMR}$ (D_2O) $\delta=8.64$ (s, 1H, between $-\text{CH}_3$ and N^+), 8.642-8.63 (d, $J = 7.8$ Hz, 1H), 8.286-8.273 (d, $J = 7.8$ Hz, 1H), 7.854-7.830 (t, $J = 7.8$ Hz, 1H), 7.41 – 7.38 (m, 5H), 5.67 (s, $-\text{CH}_2$, 2H), 2.42 (s, $-\text{CH}_3$, 3H). It is worth to be noted that signals of two H atoms beside N atom have been overlapped.

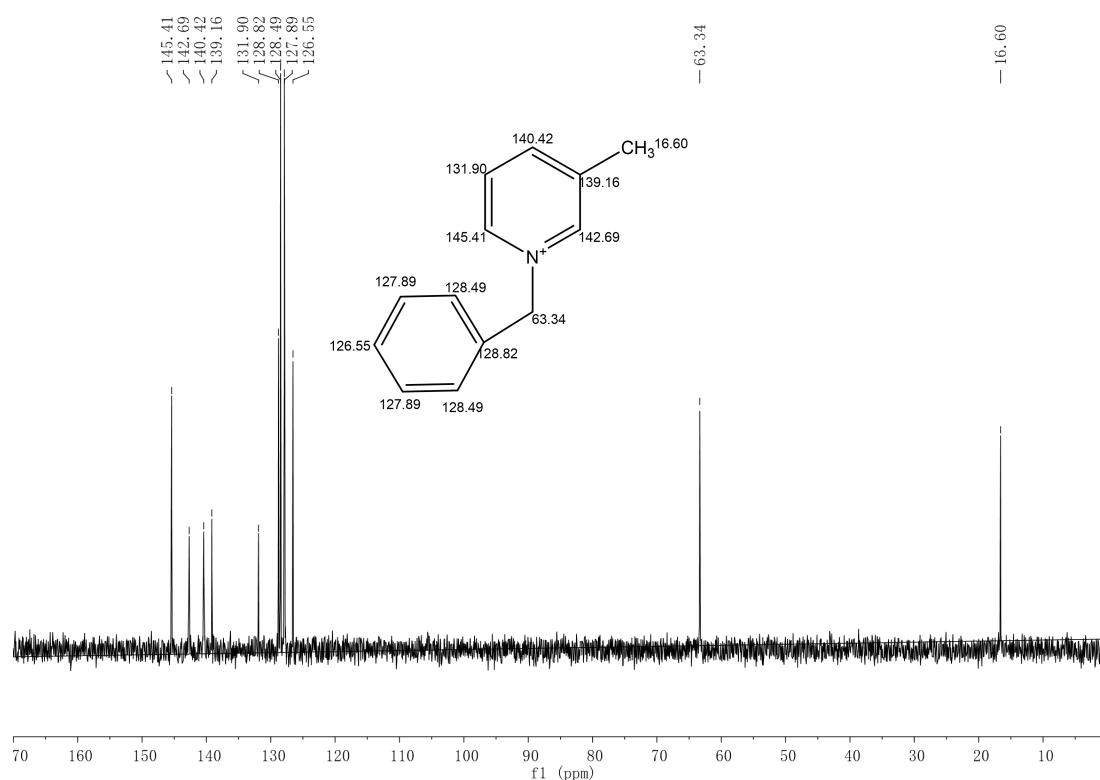


Figure S2. ^{13}C -NMR of BMP

600 MHz ^{13}C -NMR (D_2O) δ =145.41 (s), 142.69 (s), 140.42 (s), 139.16 (s), 131.90 (s);
 128.82, 128.49, 127.89, 126.55(s) in benzyl group; 63.34 (N-CH_2), 16.60(-CH_3)

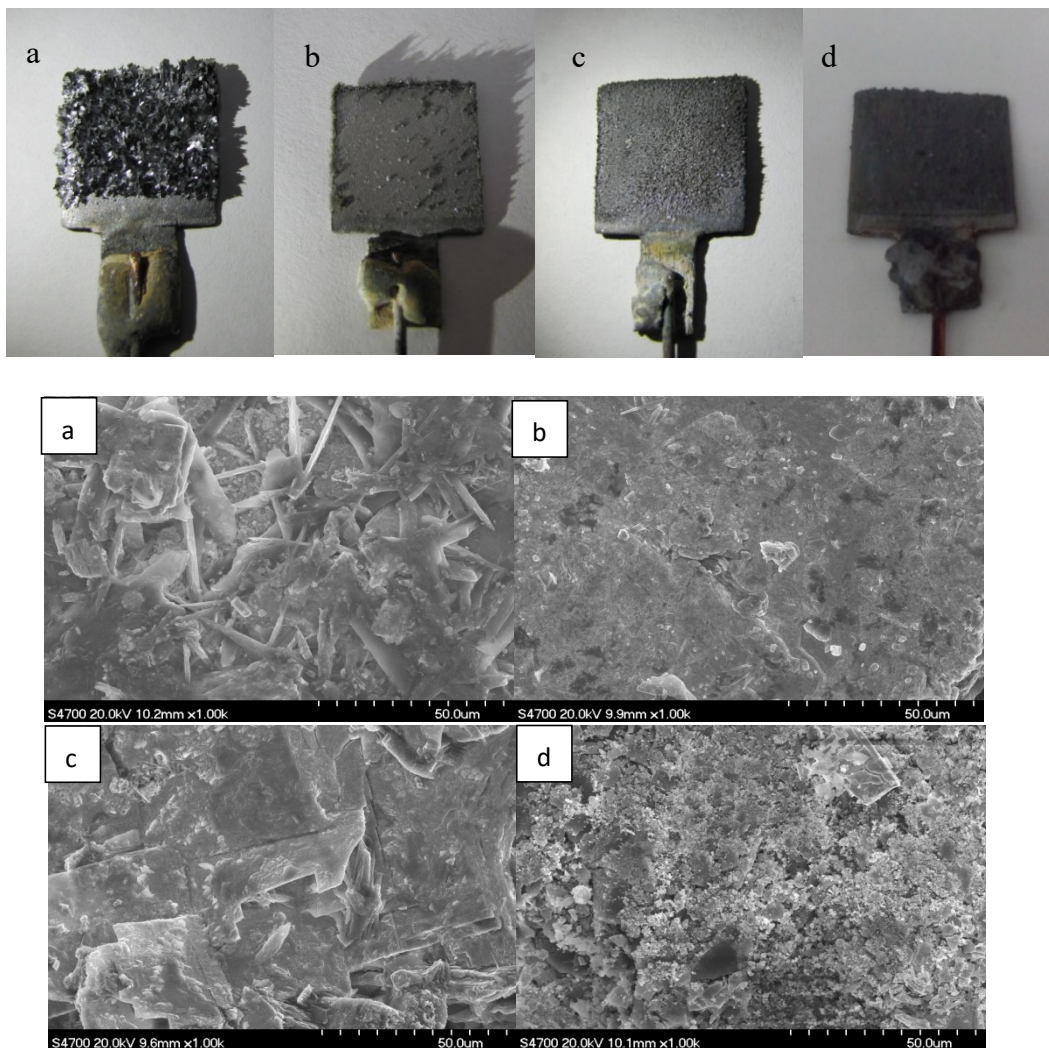
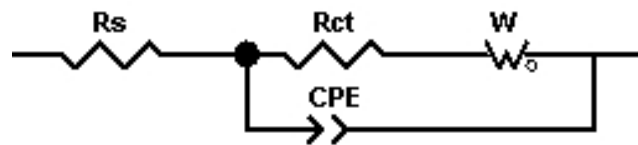


Figure S3. Digital photograph and Scanning Electron Microscope (SEM) pictures of lead deposit obtained from electrolyte without additive (a) and with 0.003 M BCP (b), 0.003 M BMP (c) and 1.5 g/L gelatin (d) at 10 mA/cm² in 300 s.

Scheme S1: Equivalent circuit used to model impedance data



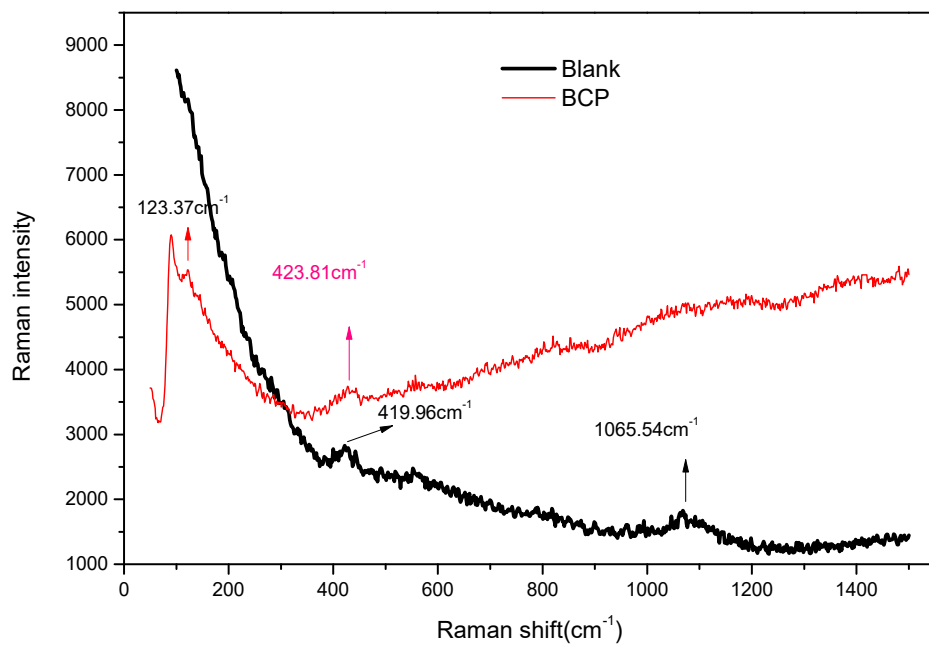


Figure S4. Raman spectroscopy of electrolyte with and without 0.003 M BCP

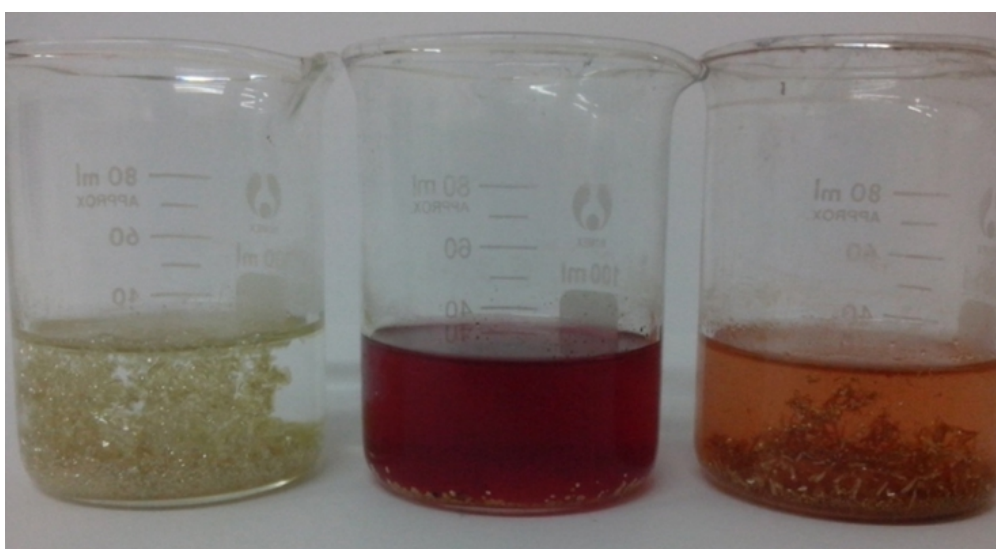


Figure S5. Photos of electrolyte without additive (left), with 0.003 M BCP (middle) and with 0.003 M BMP(right) at 288 K cooling from 353 K

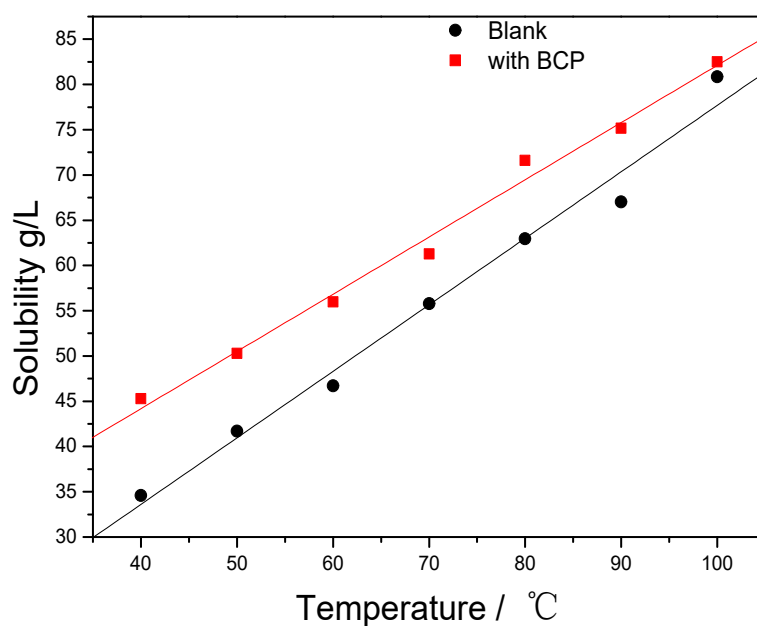


Figure S6. The solubility curve of PbO in the 6.25 M NaOH 0.1L solution without (Blank) and with 0.003 M BCP. The temperature was raised from 298 K to 373 K, then PbO was stepwisely added per gram into 0.1 L solution until PbO could not be dissolved, and the accumulated mass of PbO added was recorded.

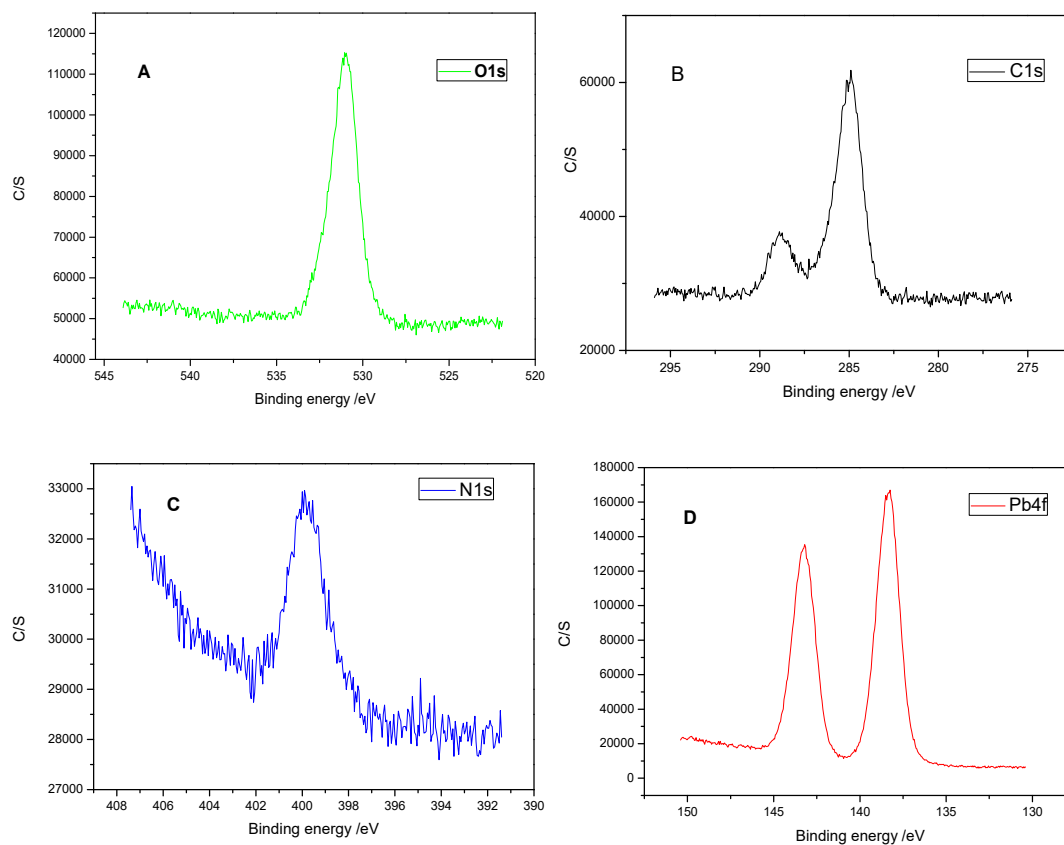


Figure S7. The XPS spectrum of O1s (A), C1s (B), N1s (C), Pb4f (D)