Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Electronic Supplementary Information:

Copper-based reversible electrochemical mirror device with switchability between transparent, blue, and mirror states

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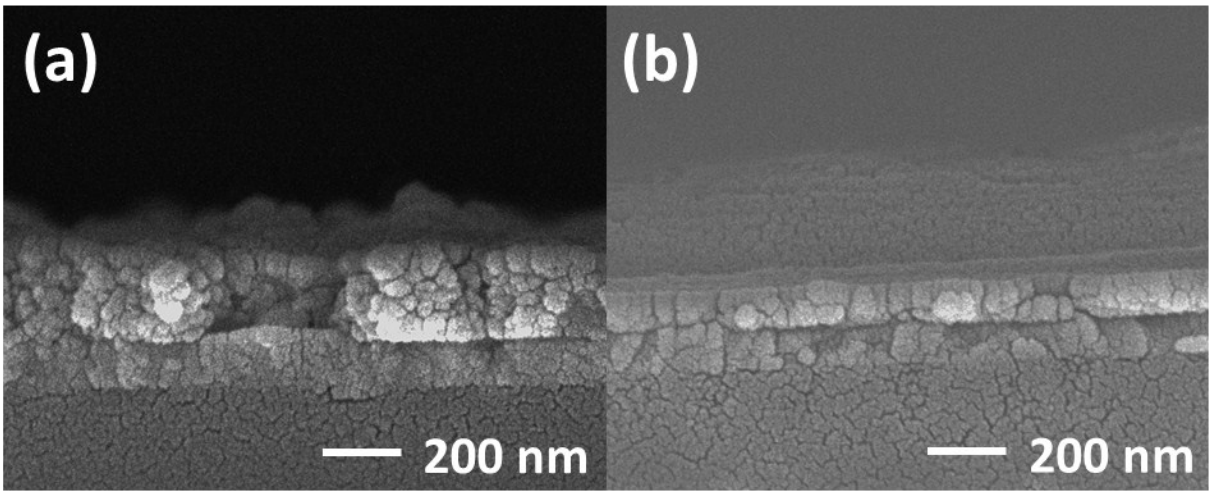

Fig. S1 Cross-section FESEM images of electrodeposited Cu films at -1.8V for 120s in (a) electrochromic solution (without PVA) and (b) polymer gel electrolyte (with PVA).

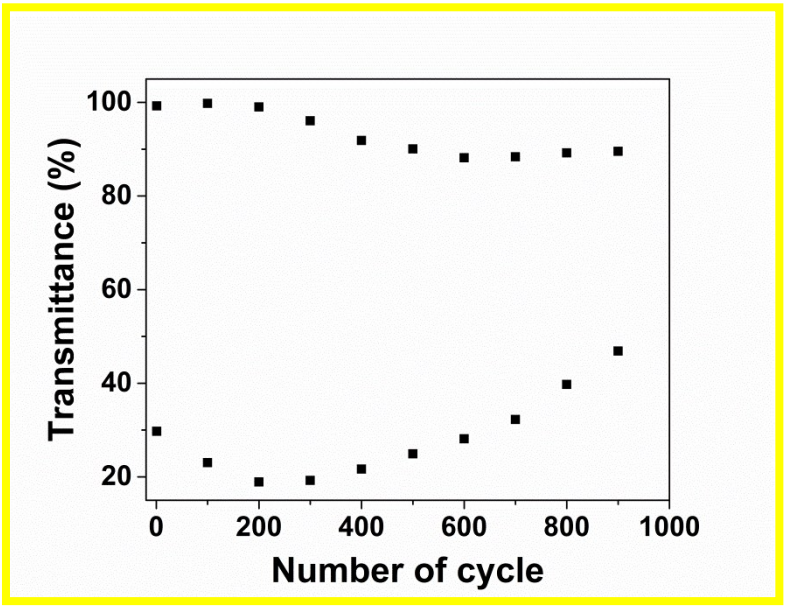

Fig. S2: Cycling performance of Cu film on the ITO electrode in the electrochromic solution for 900 cycles when switched between -1.8 V and +1.8 V for 20 s per step measured at 550 nm.

Fig. S2 shows the colored and bleached transmittance at 550 nm under applied potential of ±1.8 V for 20 s per step, which varies as a function of cycle number. The Cu film on the ITO electrode exhibited an initial transmittance modulation of 69.54 % and attained a maximum transmittance modulation of 80.58 % at the 168th cycle. The transmittance modulation of the Cu film gradually decreases during the cycling process and manages to sustain a modulation of 42.68 % after being subjected to 900 cycles. These results indicate that the electrodeposited Cu film possesses good cycling performance, which also demonstrated the reversibility of the electrochromic solution during the continuous reversible electrodeposition-dissolution process despite the generation of small amount of bubbles/gases.

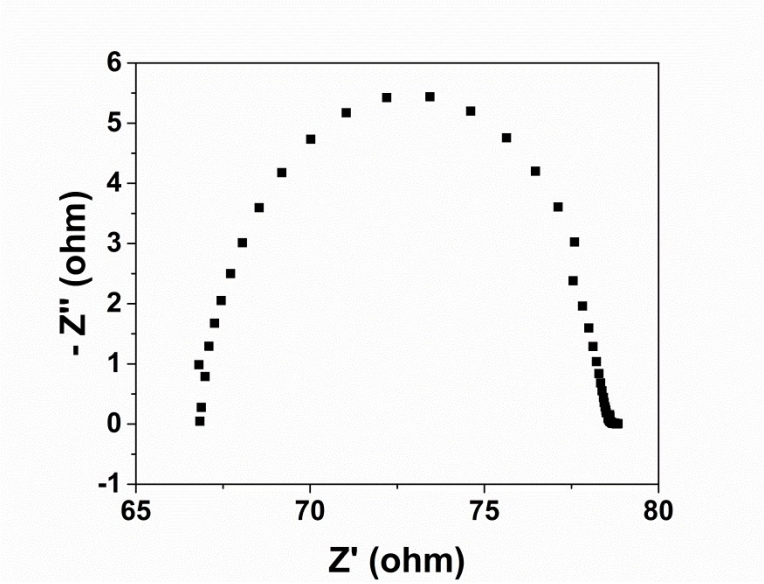

Fig. S3. Nyquist plot of the EC solution in the high frequency region.

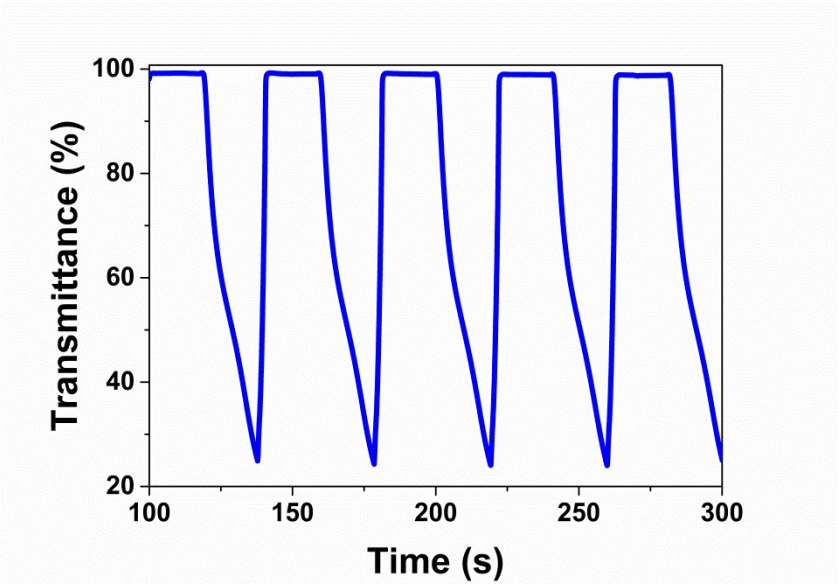

Fig. S4. *In situ* transmittance of electrodeposition and dissolution of Cu film on the ITO electrode in the electrochromic solution when switched between -1.8 V and +1.8 V for 20 s per step measured at 550 nm.

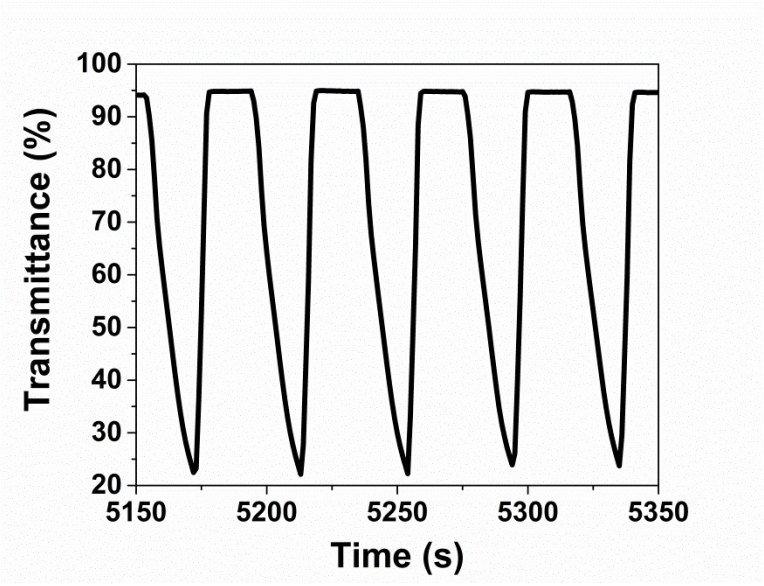

Fig. S5. *In situ* transmittance of electrodeposition and dissolution of Cu film on the ITO electrode in the polymeric gel electrolyte when switched between -1.8 V and +1.8 V for 20 s per step measured at 550 nm.