**Electronic Supplementary information**

# Tactical surface modification of 3D graphite felt as electrode of vanadium redox flow batteries with enhanced electrolyte utilization and fast reaction kinetic

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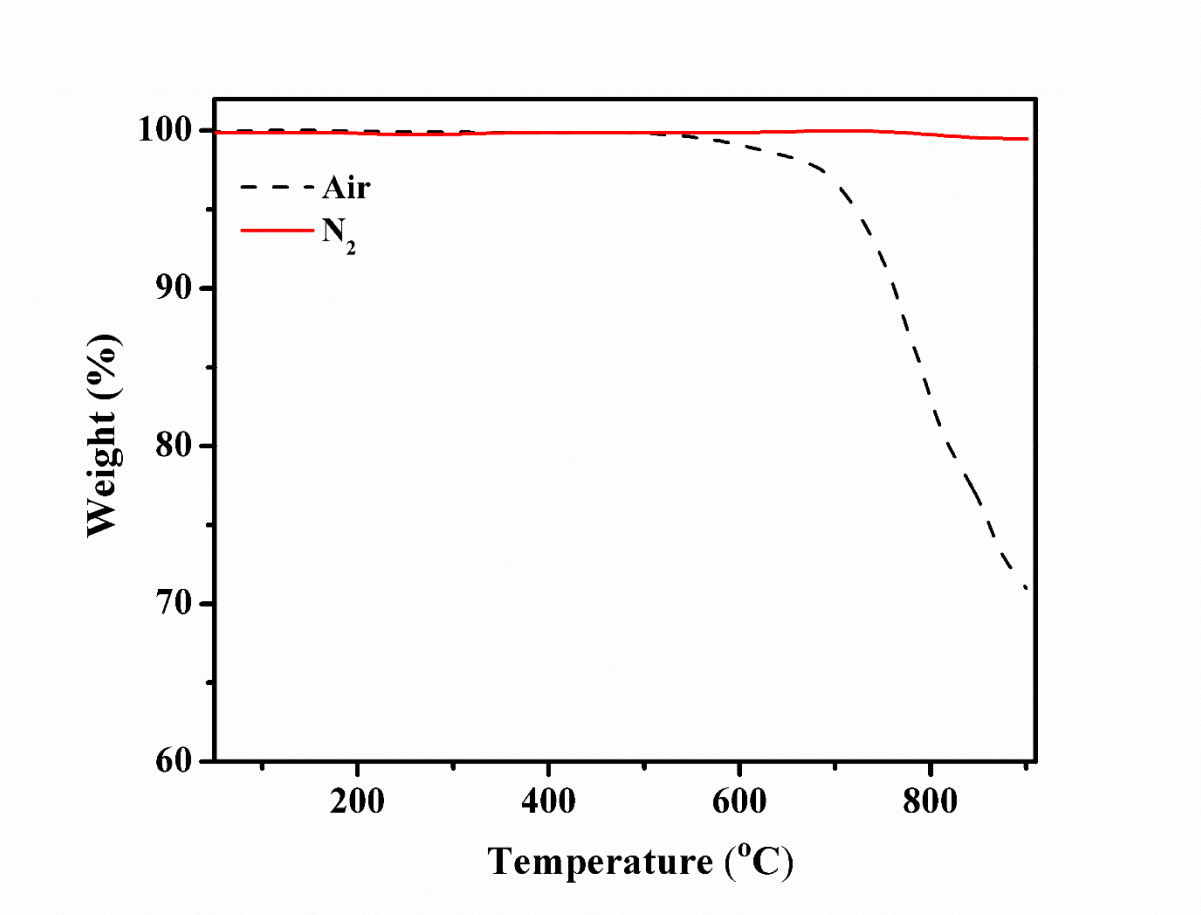


**Figure S1:** TGA analysis of GF

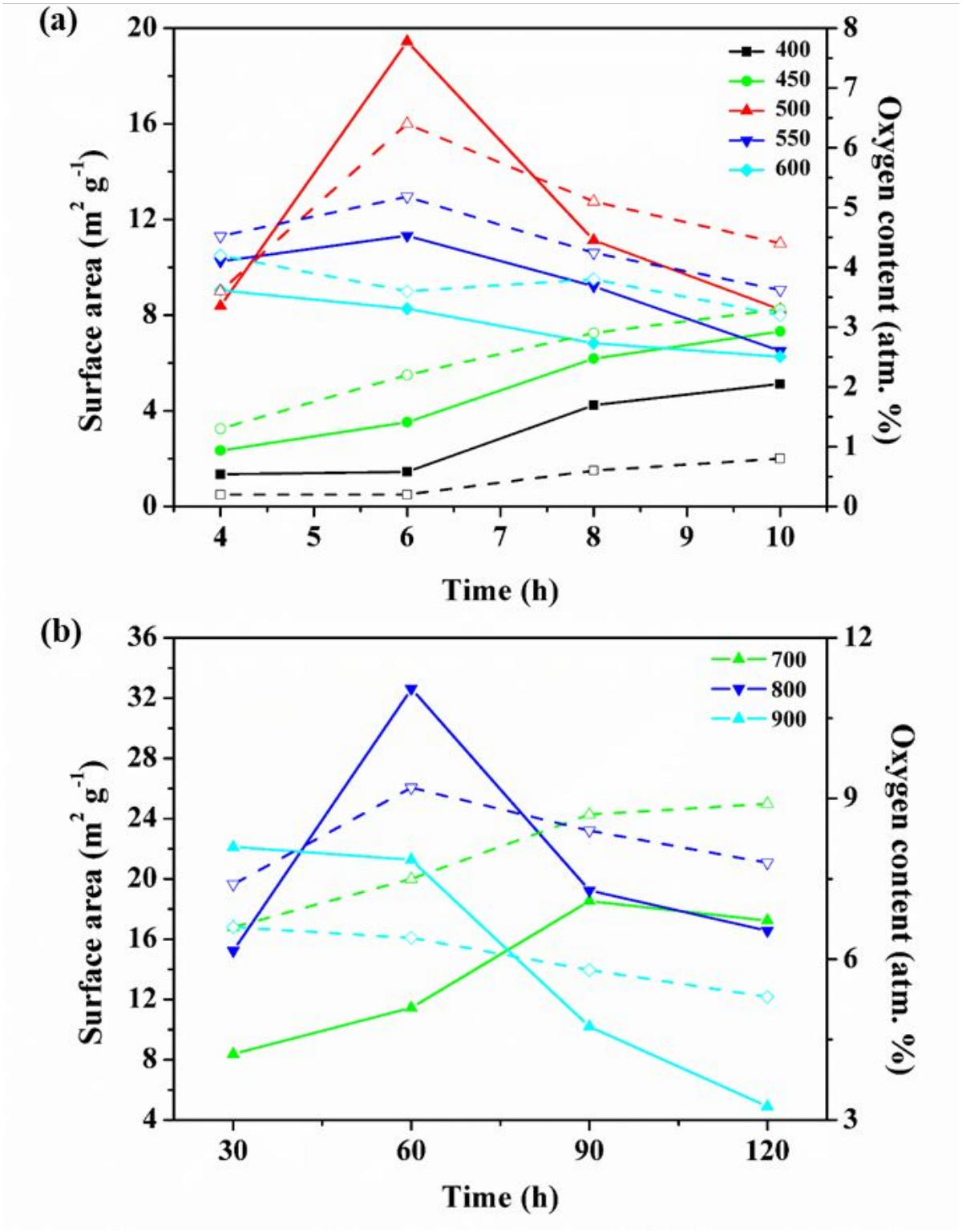


**Figure S2**: Variation in BET surface area (solid line) and oxygen content (dotted line) with variation in time and temperature of (a**)** thermally oxidized GF and (b) KOH treated TGF

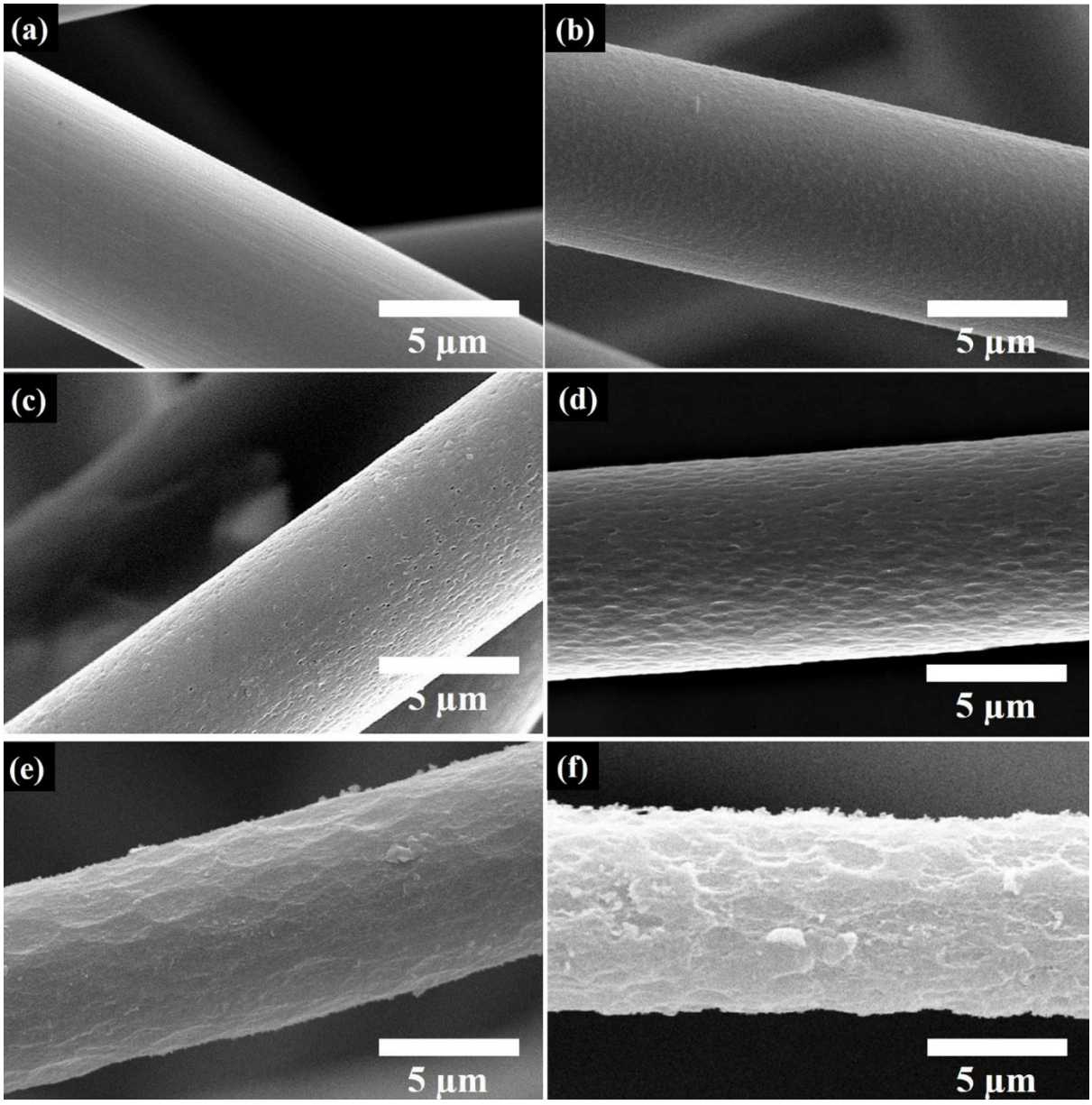


**Figure S3:** Surface morphology of (a) GF; GF treated for 6h at (b) 400 °C; (c) 450 °C; (d) 500 °C; (e) 550 °C; and (f) 600 °C

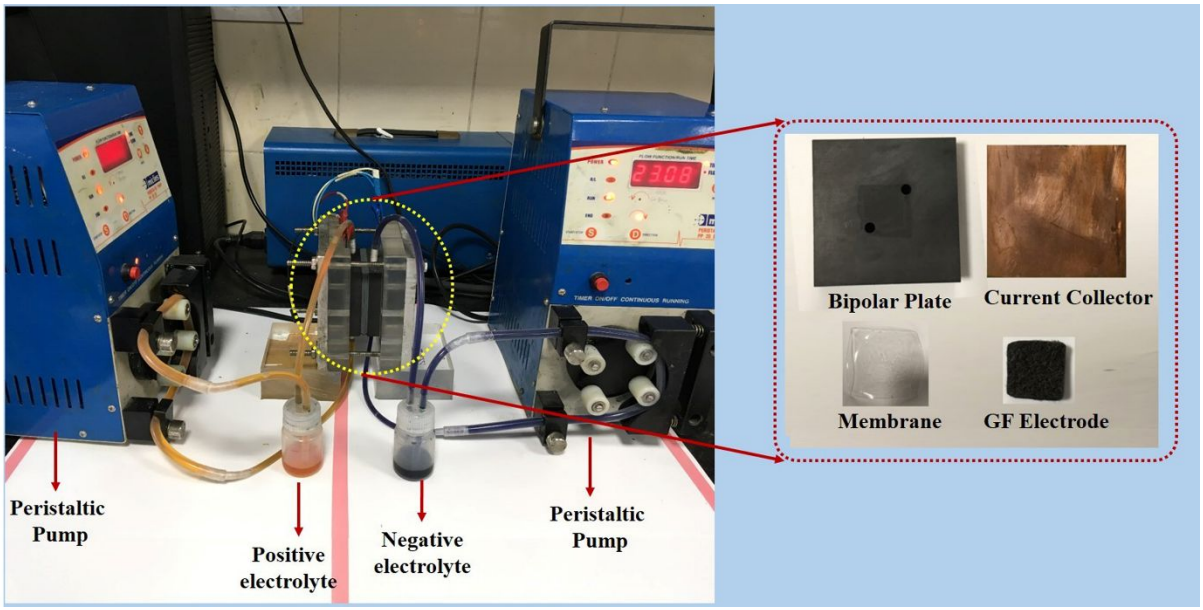


**Figure S4**: Digital photograph of VRFB system and its components

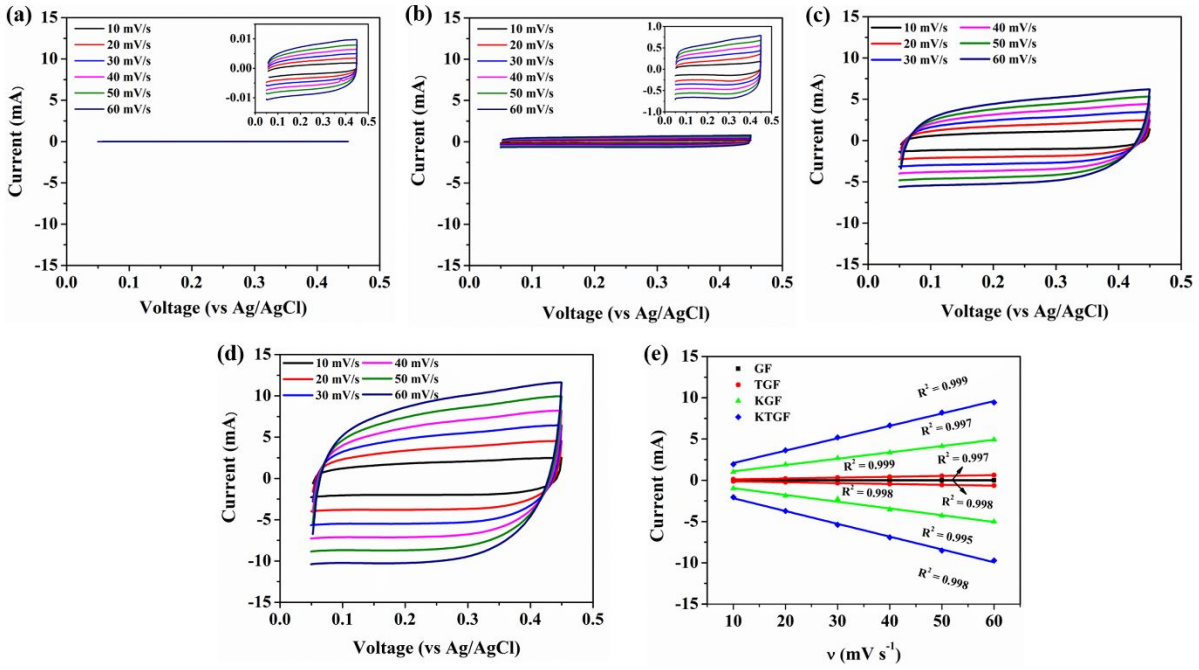


**Figure S5:** Cyclic voltammetry curves for determining electrochemically-active surface area of (a) GF, (b) TGF, (c) KGF, and (d) KTGF in non-Faradaic region potential range between 0.05 and 0.45 V in 1 M $H_2SO_4$; (c) linear fitting of anodic and cathodic charging current (measured at 0.25 V) vs scan rate for GF, TGF, KGF, and KTGF.

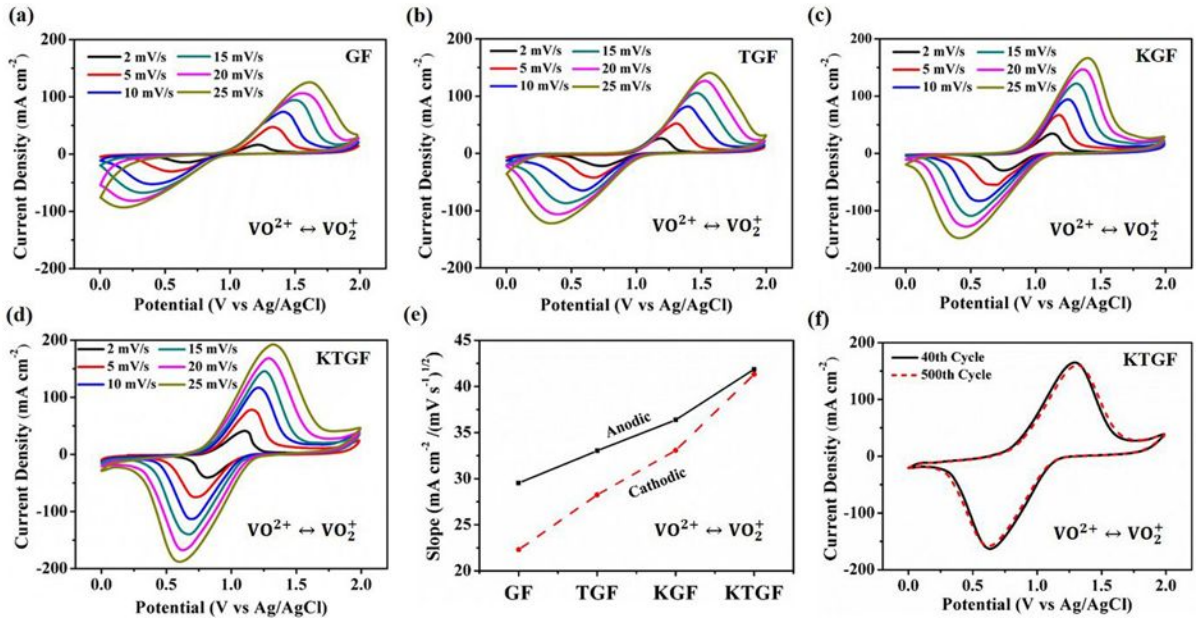


**Figure S6:** CV curves of (a) GF, (b) TGF, (c) KGF, (d) KTGF at a different scan rate in 0.1 M $VO^{2+}$ +2.5 M $H_2SO_4$ solution, (d) slope value of the curves of peak current density vs. square root of scan rate of GF, TGF, KGF, and KTGF; and (e) CV curves of KTGF before and after 500 cycles at 20 mV $s^{-1}$ in 0.1 M $VO^{2+}$ +2.5 M $H_2SO_4$ solution

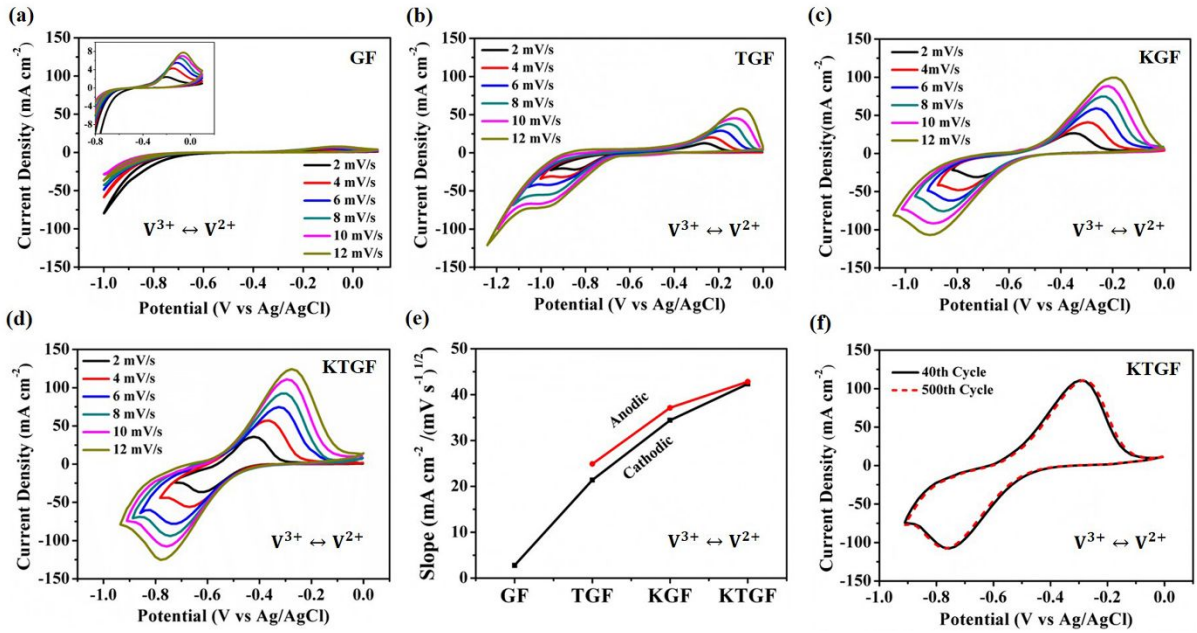


**Figure S7:** CV curves of (a) GF, (b) TGF, (c) KGF, (d) KTGF at a different scan rate in 0.1 M $V^{3+}$ +2.5 M $H_2SO_4$ solution, (d) slope value of the curves of peak current density vs. square root of scan rate of GF, TGF, KGF, and KTGF; and (e) CV curves of KTGF before and after 500 cycles at 10 mV $s^{-1}$ in 0.1 M $V^{3+}$ +2.5 M $H_2SO_4$ solution