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Supporting information for 'Electrochemical Investigation of the Role of MnO_2 Nanorod Catalysts in Water Containing and Anhydrous Electrolytes for Li-O_2 Battery Applications'

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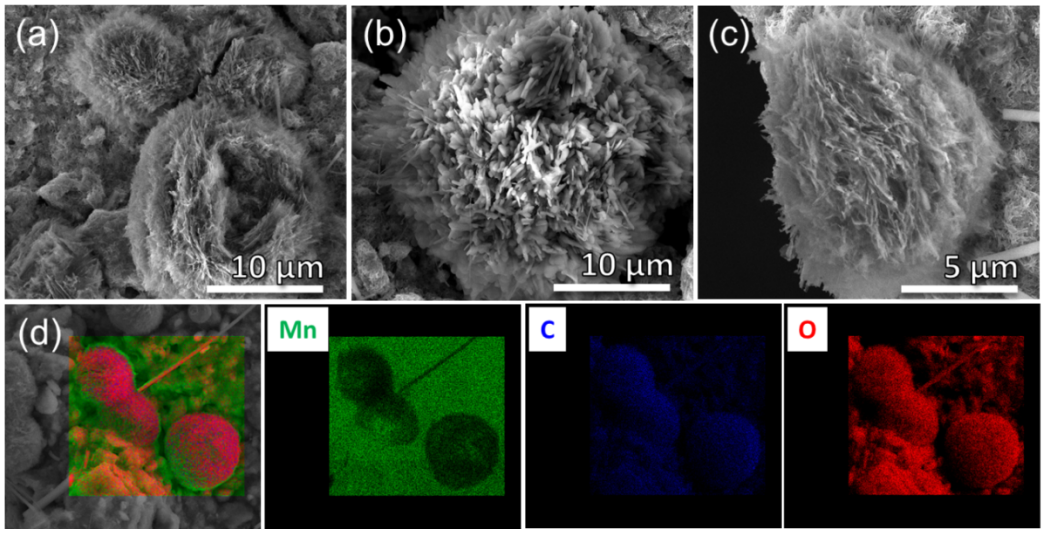

Figure S1: (a-c) Evidence of the air sensitivity of the discharge products formed on pure MnO_2 cathodes after 1 week in air. (d) EDX maps of large agglomerates (without air exposure) overlaid on an SEM image taken from the individual elemental maps shown.

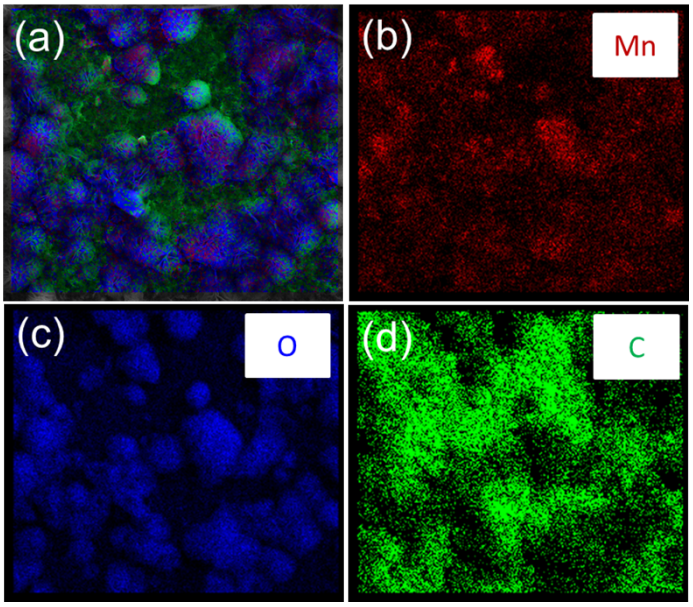

Figure S2: Low magnification EDX mapping of discharge products on a MnO_2 nanorod cathode. The composite signals overlaid on the SEM image (a) show that there is a large O signal from each agglomerate. The stronger C EDX signal from the background MnO_2 nanorod support than the discharge products suggests that they are not Li_2CO_3 but this will be further examined in future.

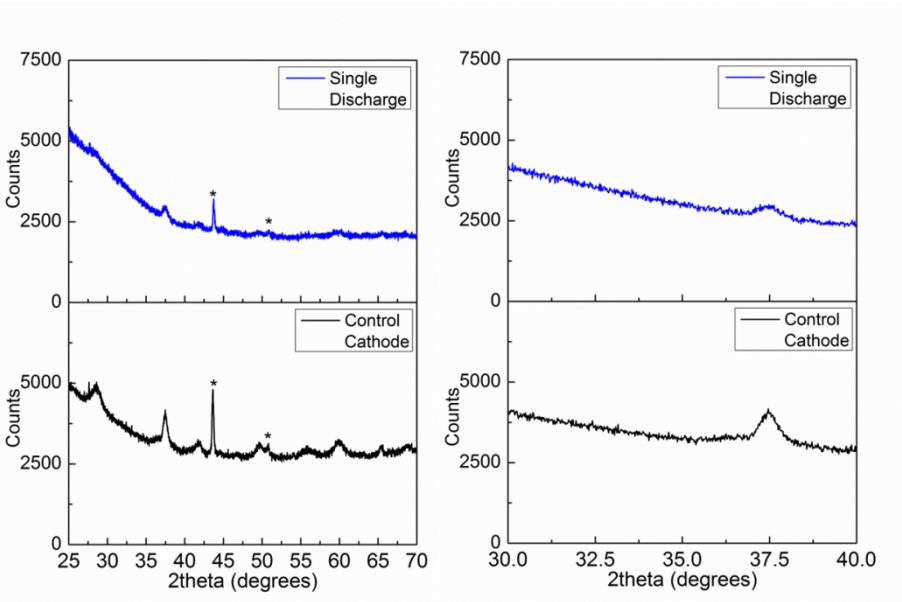

Figure S3: XRD analysis of MnO_2 cathode before and after single discharge in Sulfolane based electrolyte (100 µA applied current). There is no indication of the formation of crystalline Li_2O_2 (or any other crystalline discharge product) on the cathode surface.

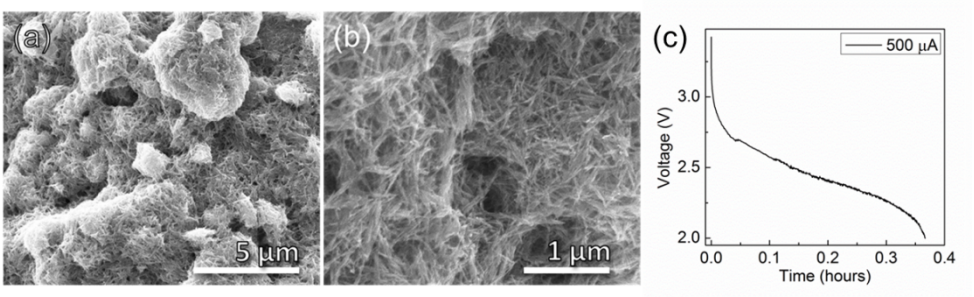

Figure S4: (a,b) SEM images of MnO_2 cathode discharged at 500 µA with corresponding discharge profile (c).

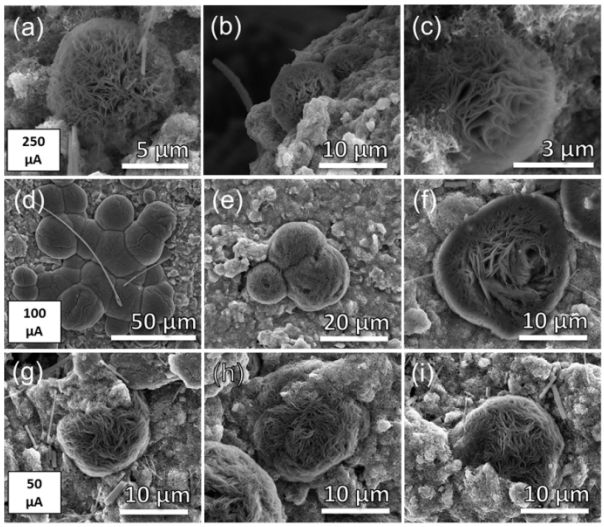

Figure S5: Additional images of examples of discharge products formed on pure MnO_2 cathodes at the same currents investigated in the main paper

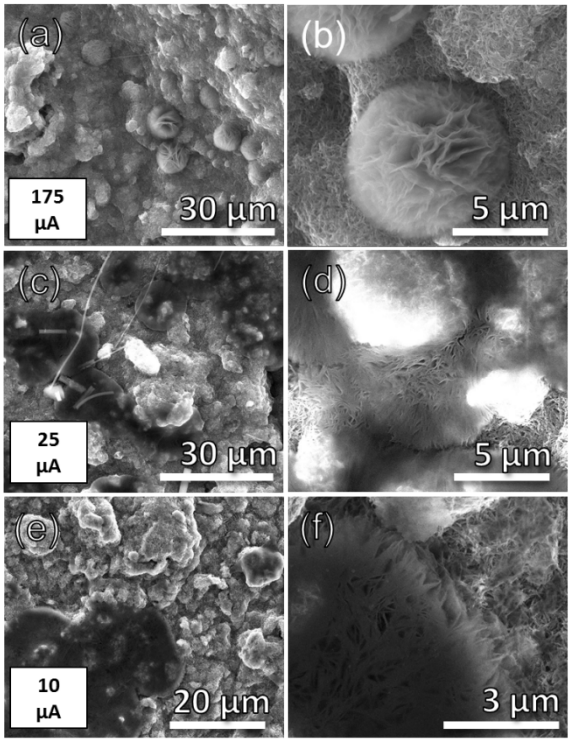

Figure S6: Additional single current discharge for MnO_2 cathodes showing progression to much larger agglomerates at 25 and 10 µA.

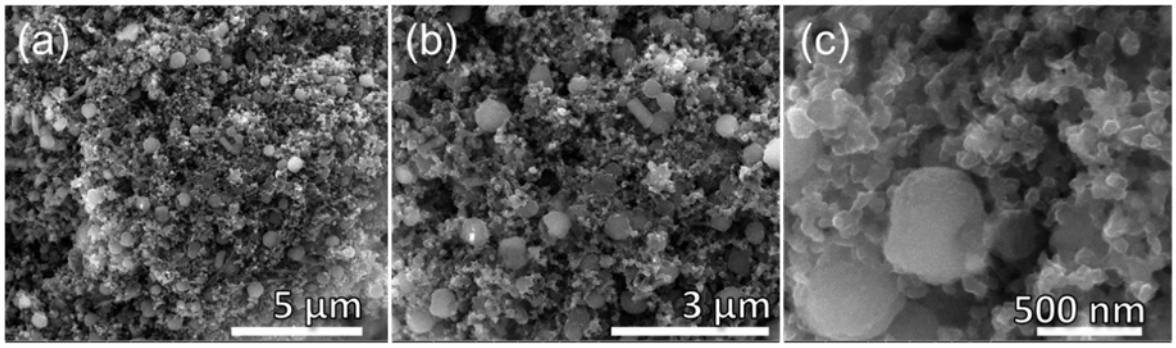

Figure S7: SEM images of discharge products formed on Super P cathode at a current rate of 100 mAg^{-1}. Large amounts of Li_2O_2 particles (typically <500 nm in diameter) can be seen at low magnification (a, b) while the characteristic toroidal shape previously noted for Li_2O_2 can be seen in the higher magnification image in c).

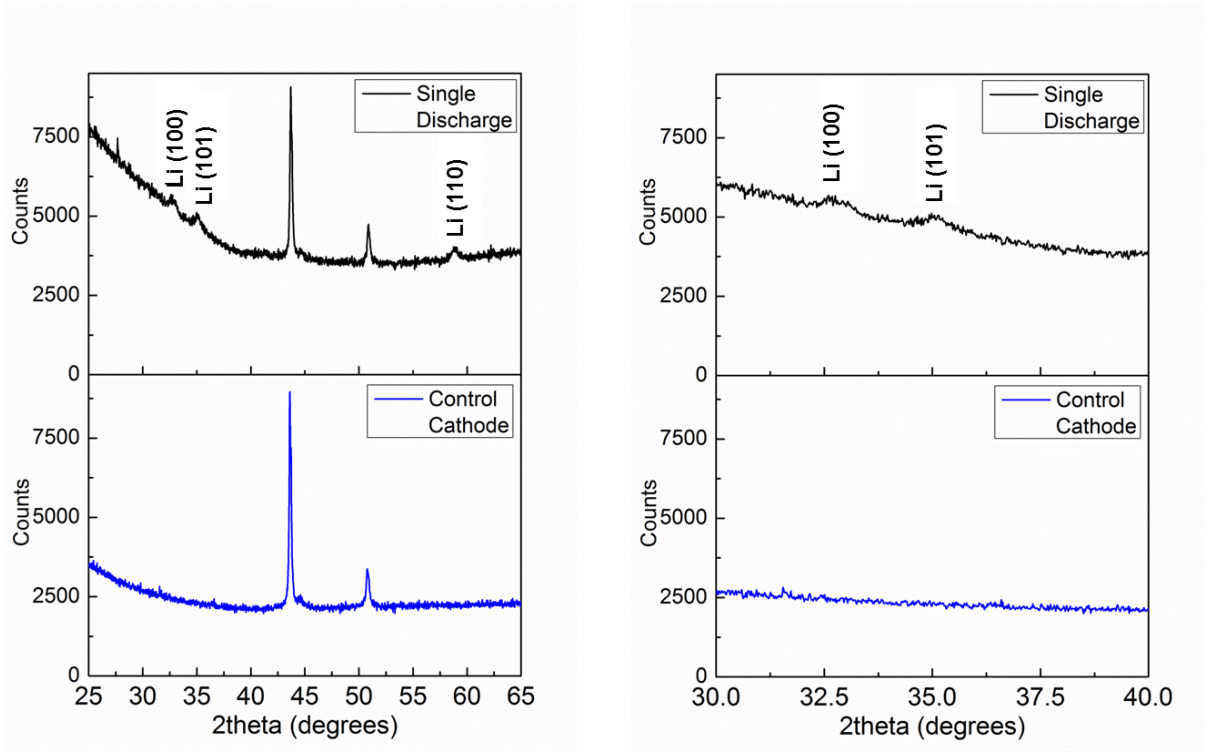

Figure S8: XRD analysis of Super P carbon cathode before and after discharge (100 µA applied current) in sulfolane based electrolyte showing clear evidence of crystalline Li_2O_2 on the cathode surface.

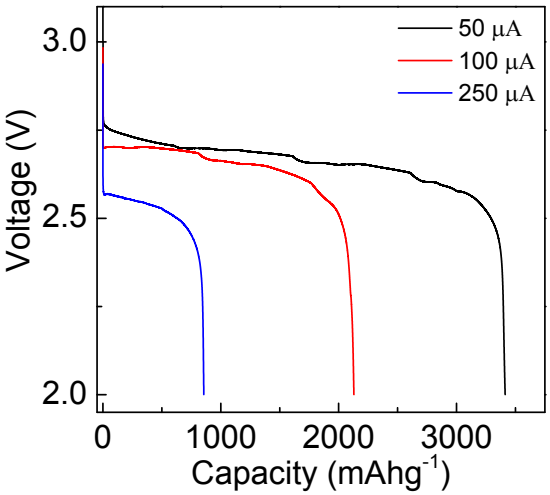

Figure S9: Discharge profiles for Super P cathodes discharged in sulfolane at various current rates

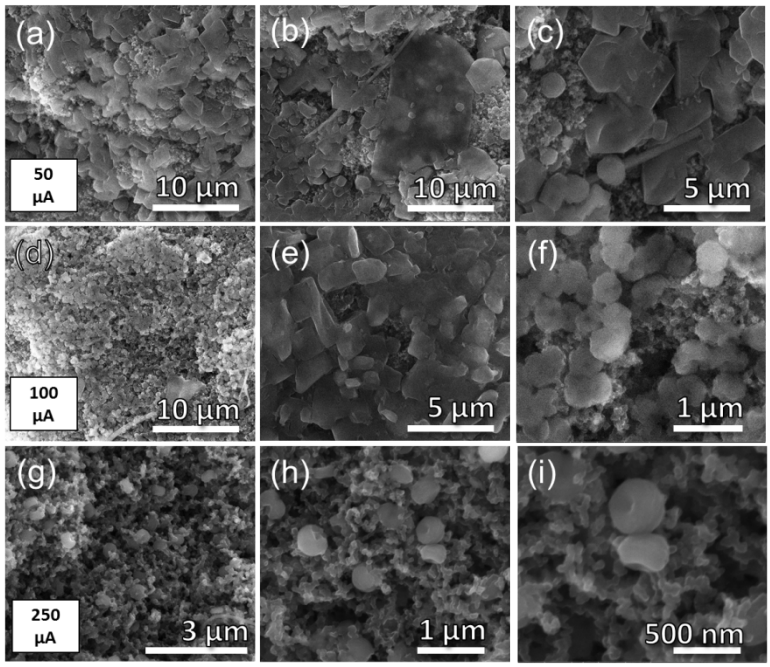

Figure S10: Additional SEM images of the discharge products formed on Super P cathodes at the same currents applied in the main text.

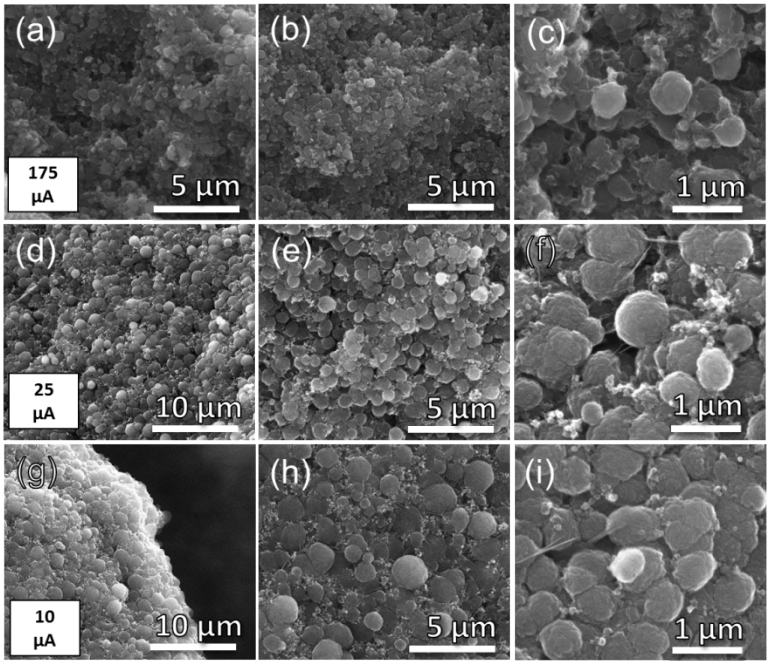

Figure S11: SEM images taken of Super P cathodes discharged at (a-c) 175 µA , (d-f) 25 µA, (g-i) 10 µA in sulfolane

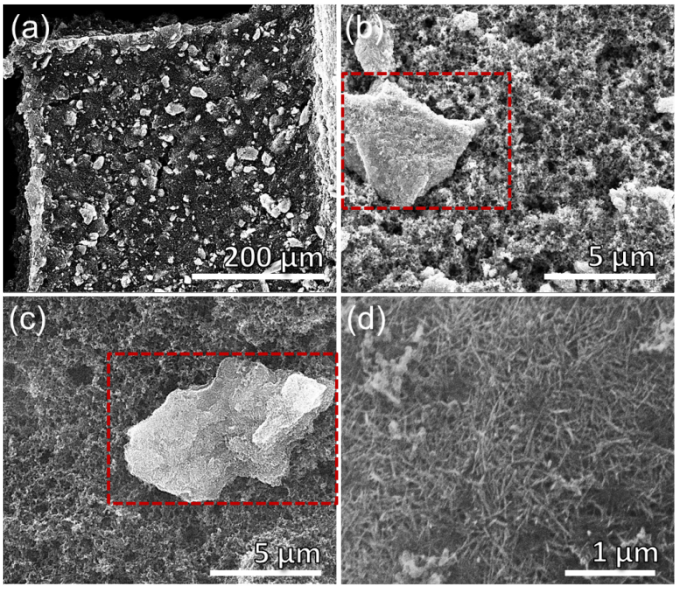

Figure S12: SEM images showing clumping of MnO_2 nanorods in 50% MnO_2/Super P cathode. Large bundles > 10 micron in size are noted.

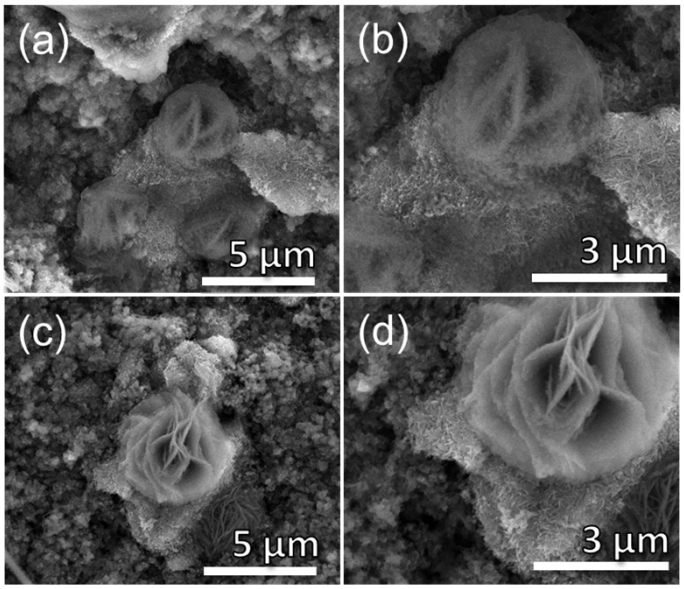

Figure S13: Additional images showing localization of large agglomerates to areas where MnO_2 bundles are located.

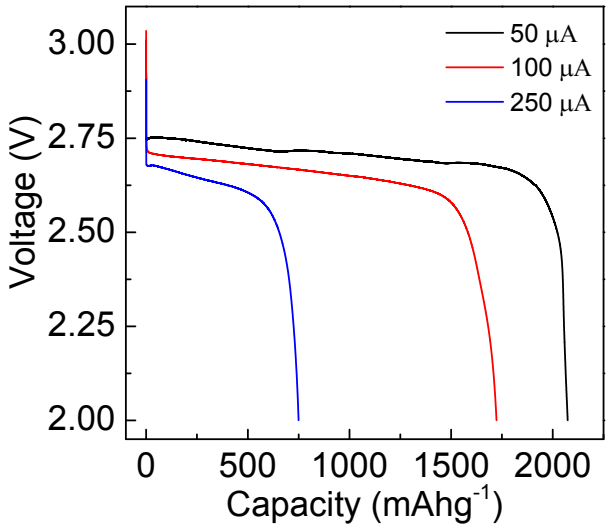

Figure S14: Discharge profiles of Super P cathodes in DMSO electrolyte

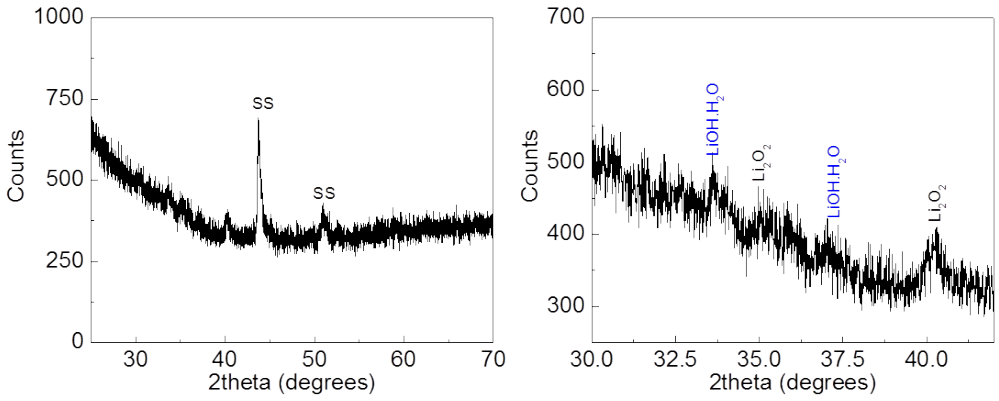

Figure S15: Super P cathode after single discharge at 100 µA with anhydrous DMSO electrolyte. In addition to reflections consistent with Li_2O_2, additional reflections attributed to $LiOH.H_2O$ were also noted.

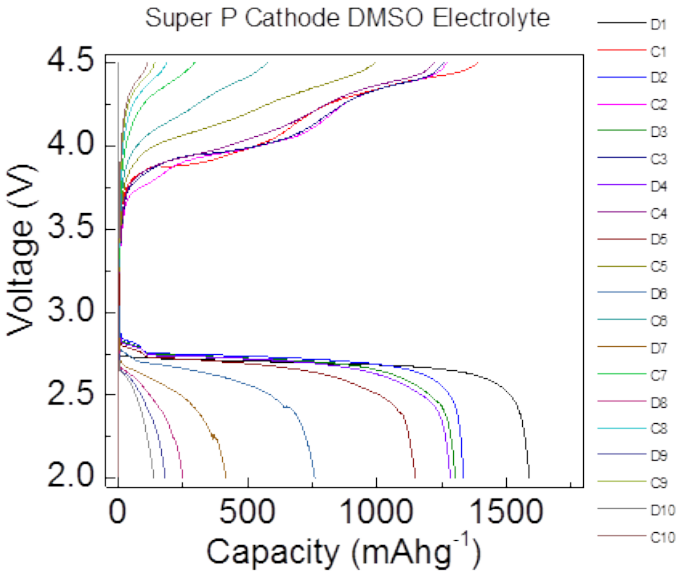

Figure S16: 10 discharge/charge profiles for Super P cathode with DMSO electrolyte showing dramatically enhanced stability compared to sulfolane electrolyte.