

Supporting Information

Enhancing Redox Stability of Lithium-Oxygen Batteries via Introducing Oxygen Pre-coordinated Vanadyl Phthalocyanine Catalyst

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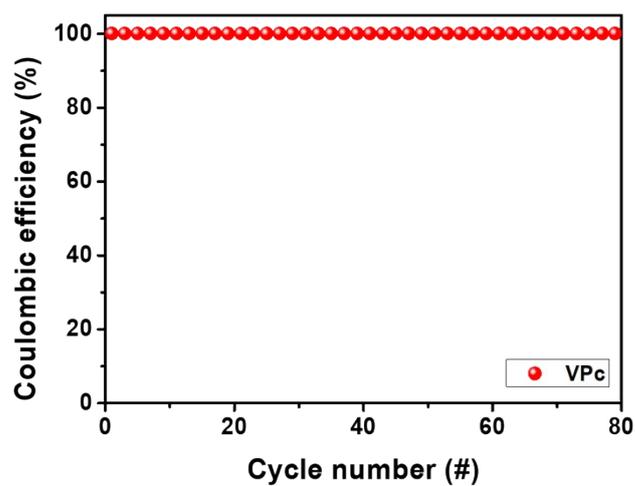


Fig. S1. Cycling performance of Li-O₂ cells with and without VOPc in LiTFSI + TEGDME solutions under a specific capacity limit of 500 mAh g⁻¹ with cycling between 2.3 and 4.5 V at a current density of 100 mA g⁻¹.

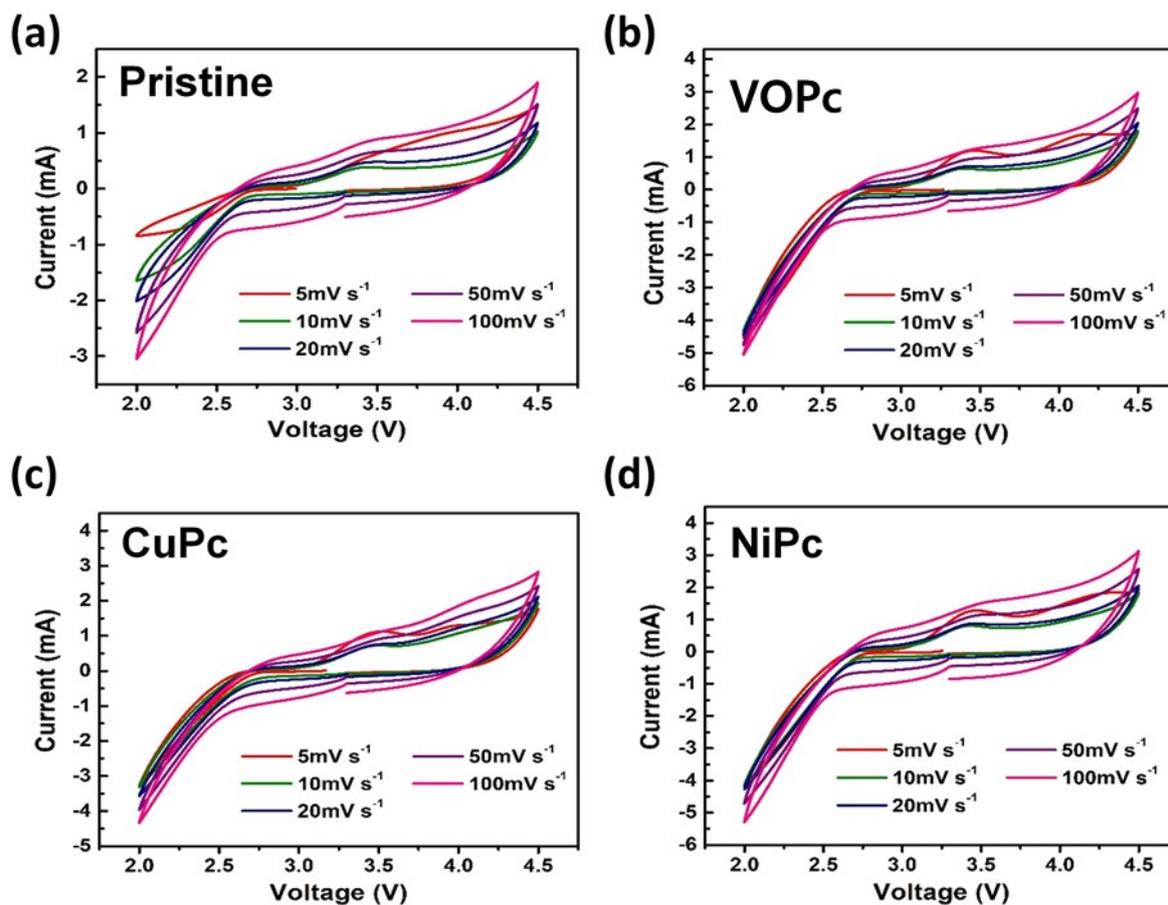


Fig. S2. Cyclic voltammetry (CV) curves of pristine Li-O₂ cells and cells employing various kinds of MPcs, such as Vanadyl (VOPc), Copper and Nickel phthalocyanine scanned at 5, 10, 20, 50, and 100 mV s⁻¹.

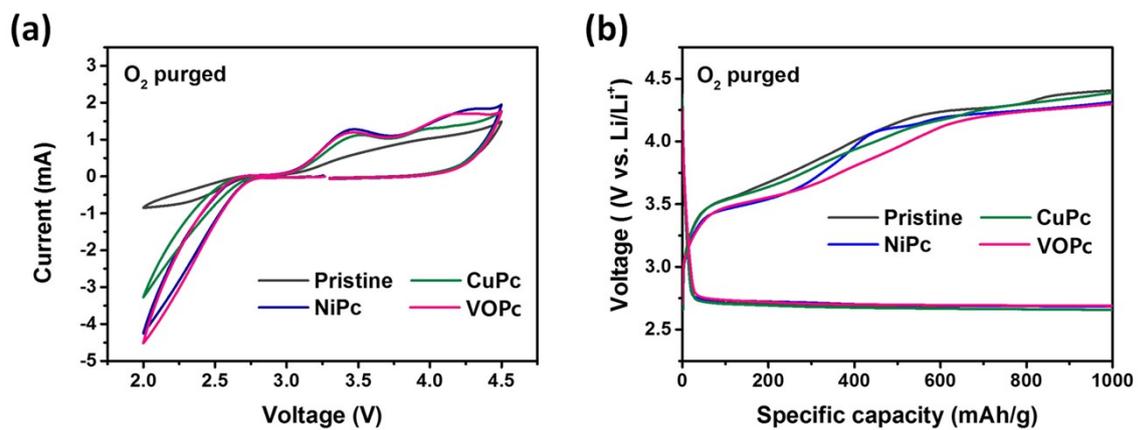


Fig. S3. (a) CV curves of pristine and Cu-, Ni-, and VOPc containing Li-O₂ cells at 5 mV s⁻¹. (b) Charge/Discharge curves at 1st cycle, in window 2.3 – 4.5 V of Li-O₂ cells fabricated using MPCs.

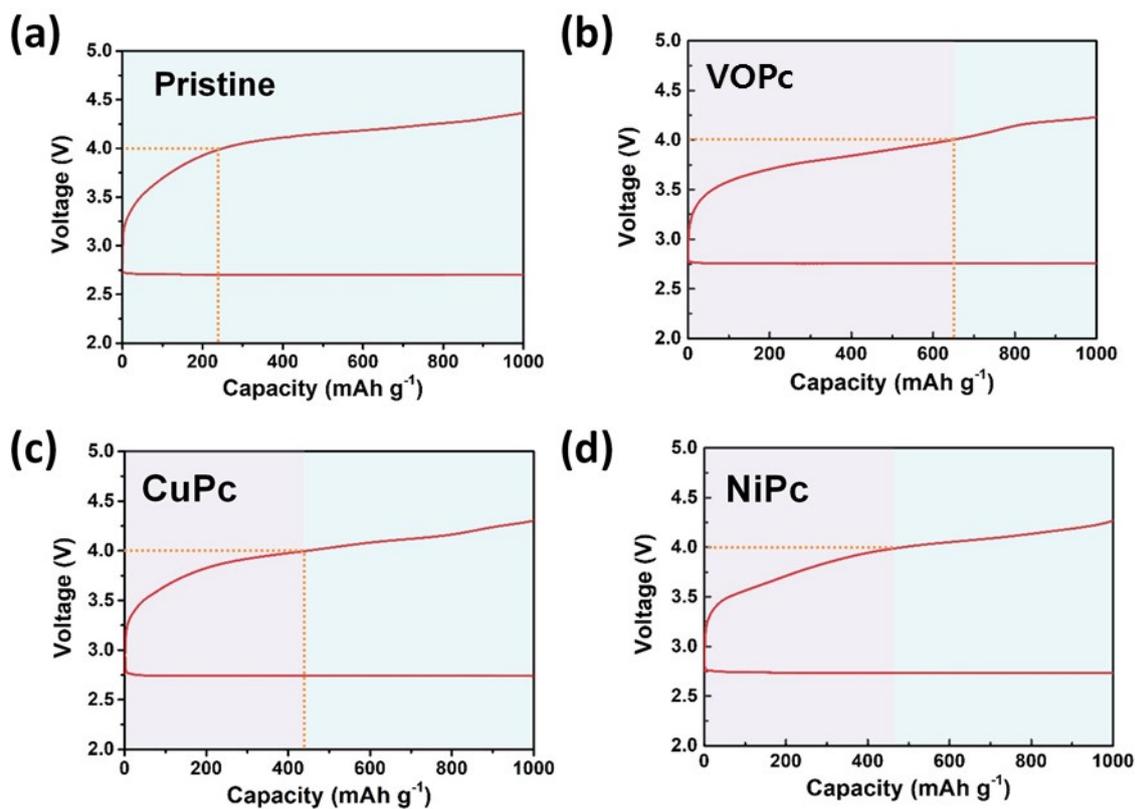


Fig. S4. Ratios of 'MPC-mediated' and 'Direct oxidation' in the charge/discharge curve, according to the type of phthalocyanine. During charge process, the parts of 'MPC-mediated' and 'Direct oxidation' are divided based on the voltage of 4.0 V

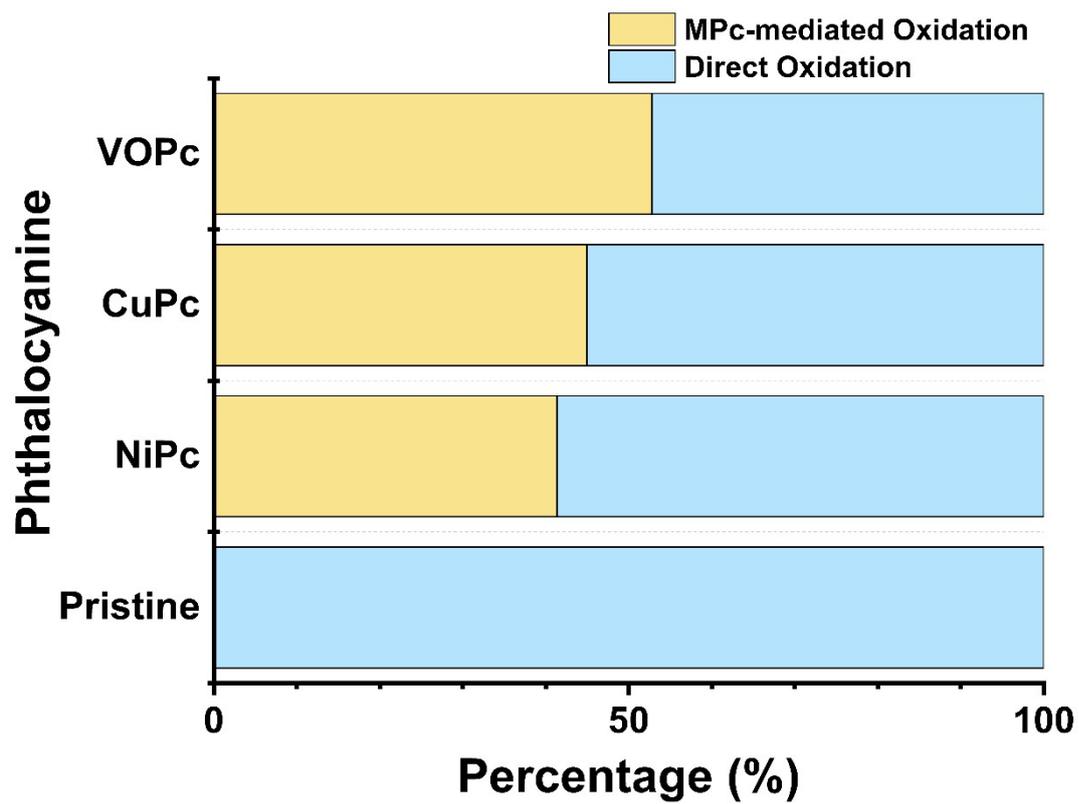


Fig. S5. The percentage of ‘MPC-mediated’ and ‘Direct oxidation’ of pristine, Ni-, Cu-, and VOPc containing Li-O₂ cells during charging process.

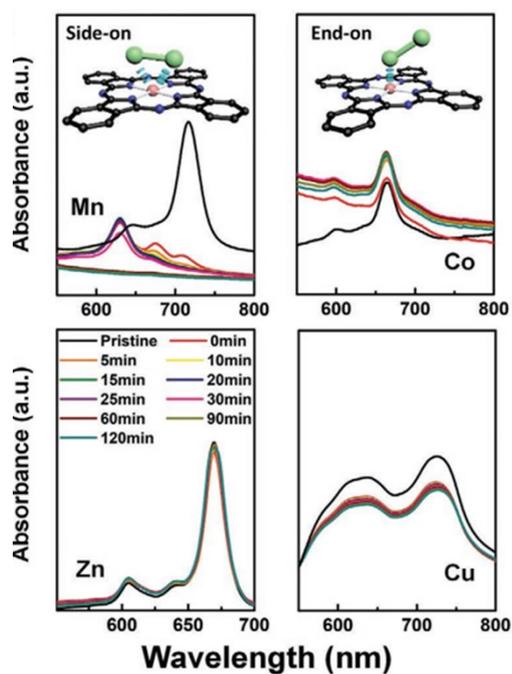


Fig. S6. UV-vis spectra of four MPCs at different times after superoxide injection. Wavelength range 550–800 nm was applied to all MPCs to detect the state of MPC central metal atoms. If states of central metals are altered, some peaks would shift or change in that range.

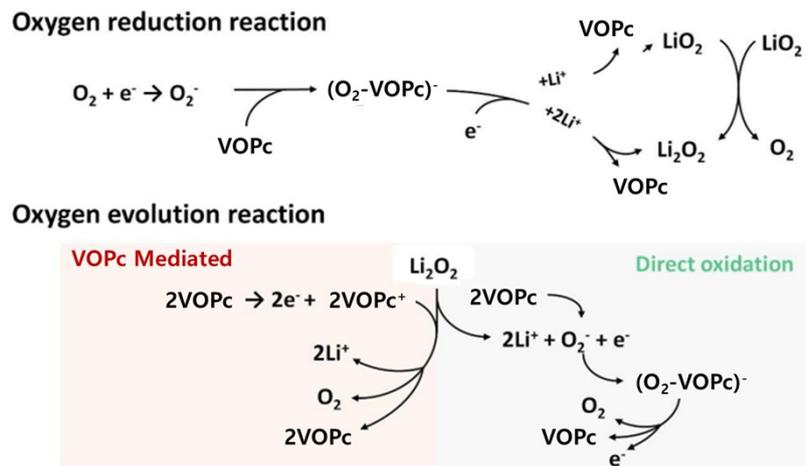


Fig. S7. Proposed oxygen reduction and evolution reaction mechanisms for VOPc-containing Li–O₂ cells.

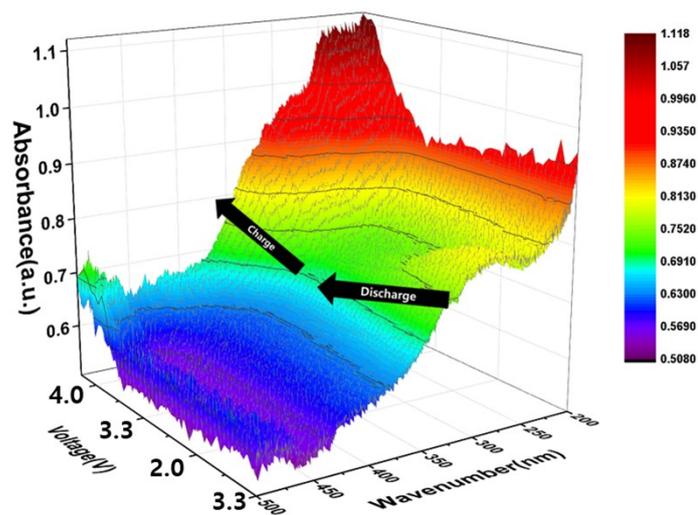


Fig. S8. Real-time spectroelectrochemical analysis(in-situ UV-vis) of VOPcs at different times during Cyclic voltammetry(CV) test (2.0V-4.0V). Wavelength near 300 nm was applied to detect state of VOPc central metal atoms. If states of central metals are altered, some peaks would shift or change in that range.