Supporting Information


Oxide Catalysts for Rechargeable High-Capacity Li–O₂ Batteries

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Figure S1. Energy dispersive X-ray spectroscopy (EDX) results for (a) nanocrystalline lead ruthenate (PbRO) and (b) bismuth ruthenate pyrochlores (BiRO) showing the ratio between the post-transition metal and ruthenium is close to the estimation from XRD pattern analysis (1.32 and 1.62, respectively). EDX signals were captured from the entire area shown in the SEM images.
Figure S2. Nitrogen adsorption/desorption isotherms for the nanocrystalline (a) lead ruthenate (PbRO) and (b) bismuth ruthenate (BiRO) catalysts at 77 K. Surface areas are indicated.
Figure S3. The discharge-charge curves of Li-O\textsubscript{2} cells with lead ruthenate pyrochlore catalyst shown for the 2\textsuperscript{nd} and 10\textsuperscript{th} cycles, with a cutoff capacity of 2000 mAh g\textsuperscript{-1}. 

Figure S3
Figure S4. (a), (c) SEM images and (b), (d) EDX analyses from the full area imaged of Au-PbRO and Au-SiO$_2$ catalysts, respectively. The gold (visible as bright white dots) accounts for 21 % and 24 % of the total catalyst mass for Au-PbRO and Au-SiO$_2$ respectively.
Figure S5. Thermogravimetric analysis (TGA) and differential thermal analysis (DTA) for lead ruthenate coated carbon black. The soft carbon black is combusted at 300 °C, showing that lead ruthenate accounts for 30 wt. % of the total catalyst mass.
Figure S6. Anodic potential sweep measurement for the 1M LiPF$_6$/TEGDME electrolyte under an argon and oxygen atmosphere to verify the electrochemically stability window for this electrolyte system. The electrolyte starts to decompose earlier in case of the oxygen environment and the rate significantly increases over 4.4 V.