

Electronic Supplementary Information

A Li-O₂/CO₂ battery

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Experimental details:

Cell construction and evaluation

Ketjen-black (ECP-600JD, Mitsubishi Chemical), PTFE binder (F104, Daikin Chemical), Li foil (0.4 mm, Honjou Metal), Li bis(trifluoromethanesulfonyl)imide (LiTFSI, Kishida Chemical) and mixed solvent of ethylene carbonate (EC) and diethylcarbonate (DEC) (3:7 vol, Tomiyama Chemical) were used as received. A separator film was purchased from Tonen Chemical (25 μm of thickness, E25MMS).

Battery evaluation was carried out by charge-discharge cycling apparatus (ASKA electronics) at 25 °C, and the current density was 0.1-0.2 mA/cm².

Measurements

IR spectra of the charged electrodes were measured using a FT-IR spectrometer (AVATAR 360, Nicolet). Raman spectra were measured using a Laser Raman spectrometer (NRS-3300, JEOL). The cross-section of the electrodes were characterized using Focused Ion Beam - Scanning Electron Microscopy system (FIB-SEM) (Hitachi, FB-2000A & S-4300 Type II) at an acceleration voltage of 15 kV. Gallium ion beam was used for cutting the electrode. The samples were transferred from a glove box to the SEM chamber using a closed vessel to avoid exposure to the air.

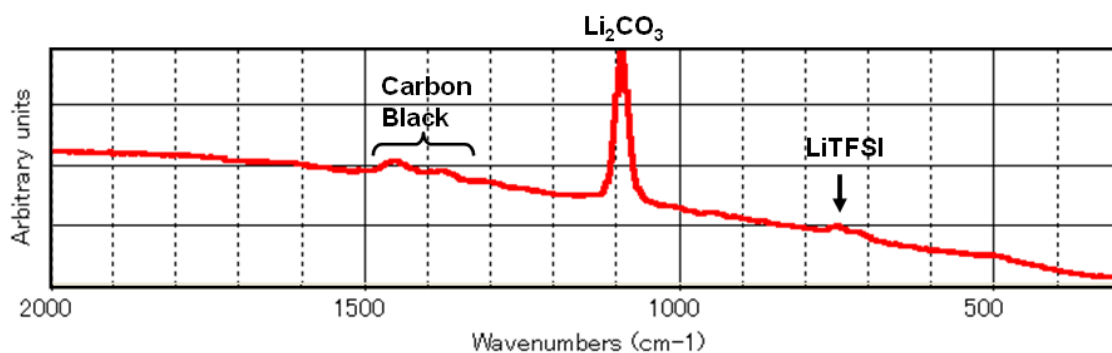


Fig. S1. Raman spectrum of the discharged cathode of Li-O₂/CO₂ batteries (O₂:CO₂ =1:1 vol.).

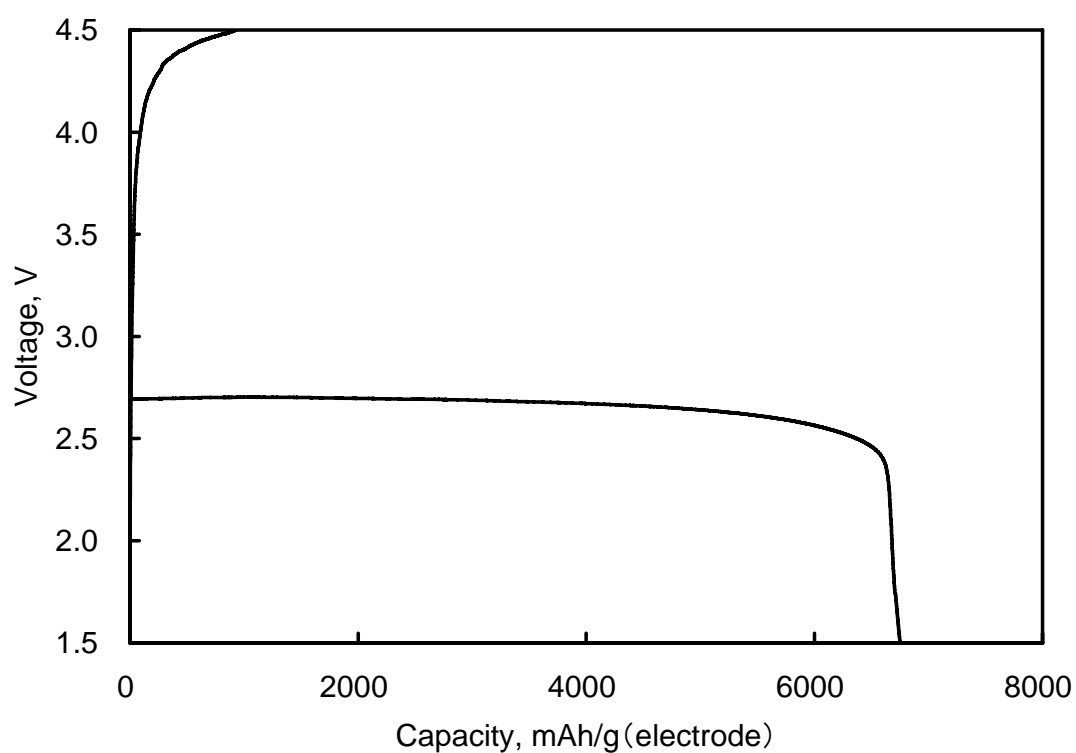


Fig. S2. Discharge-charge curve of Li-O₂/CO₂ batteries (O₂:CO₂ =1:1 vol.).

Current density(discharge/charge) = 0.1/0.05 mA/cm².

Charge limit = 4.5V.