## Effects of a solid electrolyte coating on the discharge kinetics of a LiCoO<sub>2</sub> electrode: Mechanism and potential applications

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Thickness evaluation and its errors:

LBO coating thickness was not directly measured, instead we targeted three different LBO coating thickness, 10, 34 and 100 nm to scope its influence. Required volumes of LBO to obtain desired thickness were estimated knowing the surface of one LCO particle, estimated from the average particles aggregates measured up to 7.0µm, and from the number of LCO particles contained in 5.0 g, estimated from the volumetric mass and the volume of one LCO particle. From this, the quantities of each LBO precursor were calculated. According to the all parameters, the quantities of each LBO precursor were calculated for the coting experiments. We assumed that the LBO precursors were fully deposited on the LCO particles and that the LBO deposition did not undergo shrinkage during the heat treatment. The thickness relative errors were calculated considering the following sum:

Thickness error = Concentration error + Particle size error + Solution volume error

In which the concentration relative error is given by

$$Concetration\ error = \frac{\Delta m\ [LiOH]}{m\ [LiOH]} + \frac{\Delta m\ [H_3BO_3]}{m\ [H_3BO_3]} + \frac{\Delta m\ [PVP]}{m\ [PVP]} + \frac{\Delta m\ [H_2O]}{m\ [H_2O]}$$

And the volume of the solution relative error by the vessel uncertainty.



Figure S1: a) FE-SEM image of LCO@LBO 34 nm particles, with the analyzed area marked by an orange cross. b) EDS analysis of acicular LCO@LBO 34 nm particles. EDS analysis of dark areas revealed the presence of O and B, and the Li signal was concluded to overlap with the intense low-energy secondary electron peak. The above particles were most likely glassy LBO.



Figure S2: a) C 1s and b) O 1s high-resolution spectra of bare LCO (black), LCO@LBO 20 nm (green), LCO@LBO 34 nm (blue), and LCO@LBO 100 nm (red). Deconvolution of the C 1s spectra of bare LCO, LCO@LBO 20 nm, and LCO@LBO 34 nm afforded three components located at 284.6, 285.3, and 288.5 eV attributed to C–C, C–O, and O=C–O bonds, respectively, and probably originating from surface-adsorbed contaminants. Superposition revealed that LCO@LBO 100 nm exhibited a higher proportion of C–O bonds and additionally contained  $Li_2CO_3$  (289.7 eV). Deconvolution of the O 1s spectra revealed the presence of a narrow peak centered at 529.4 eV and characteristic of oxygen atoms in the LCO crystal network. This peak was detected irrespective of LBO coating thickness, as highlighted by the marker on the spectra.



Figure S3: a) SEM image and b) AES spectrum of an LCO@LBO 100 nm particle recorded at the point marked by a red cross. c) SEM image and d) AES spectrum of an LCO@LBO 34 nm particle recorded at the point marked by a red cross. e) SEM image and f) AES spectrum of an LCO@LBO 20 nm particle recorded at the point marked by a red cross.



Figure S4: FE-SEM images of cycled electrodes surface (after 200 cycles operated at 2C): (a, b) bare, (c, d) LCO@LBO 20nm and (e, f) LCO@LBO 34nm.



Figure S5: Cyclic voltammograms of the half-cells with various cathodes: (a)LCO-bare, (b) LCO@LBO(20 nm), and (c)LCO@LBO(34 nm). The cyclic voltammetry (CV) curves were conducted between 2.8 and 4.4 V (V vs. Li/Li<sup>+</sup>). The sweep rate was varied with 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.8, 1.0, and 1.2 mV/s using electrochemical workstation (Biologic, VSP-300).