

Supporting information

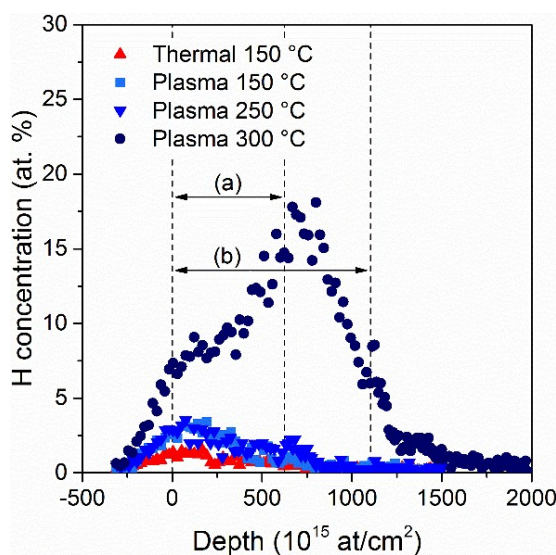


Fig. S 1: Hydrogen concentration as a function of film depth measured by ERD for thermal ALD at 150 °C and plasma ALD at 150, 250 and 300 °C. As deposited, the film thickness was ~ 50 nm. The total number of measured at/cm² was similar for the first three samples and is indicated by (a). The thickness of the plasma film deposited at 300 °C increases due to air reactivity. Therefore the thickness of this film prior to the ERD measurement was unclear. The total number of measured atoms for this sample is indicated by (b).

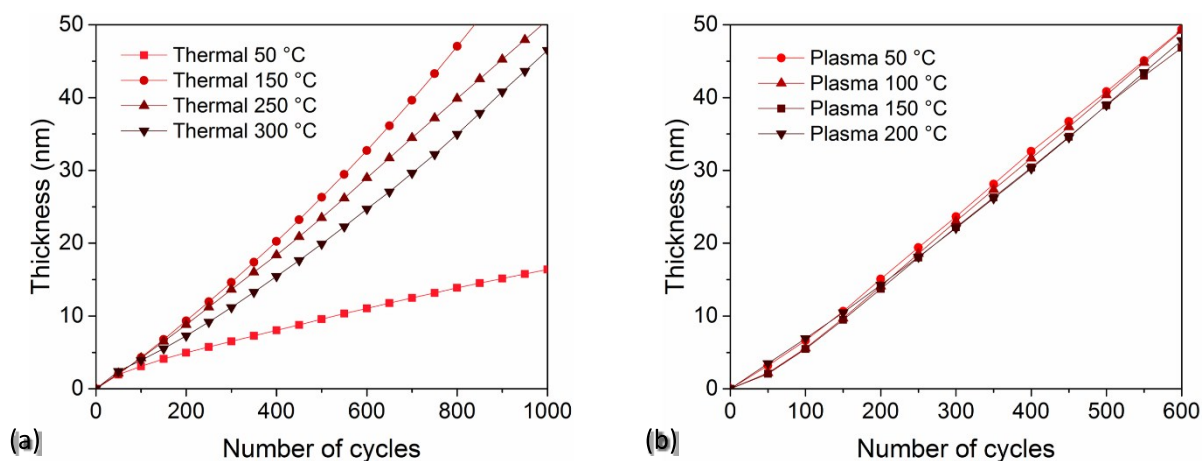


Fig. S 2: (a) In-situ SE thickness measurement for thermal ALD of Li₂CO₃ at 50, 150, 250 and 300 °C. (b) In-situ SE film growth of Li₂CO₃ plasma ALD between 50 and 200 °C showing similar growth

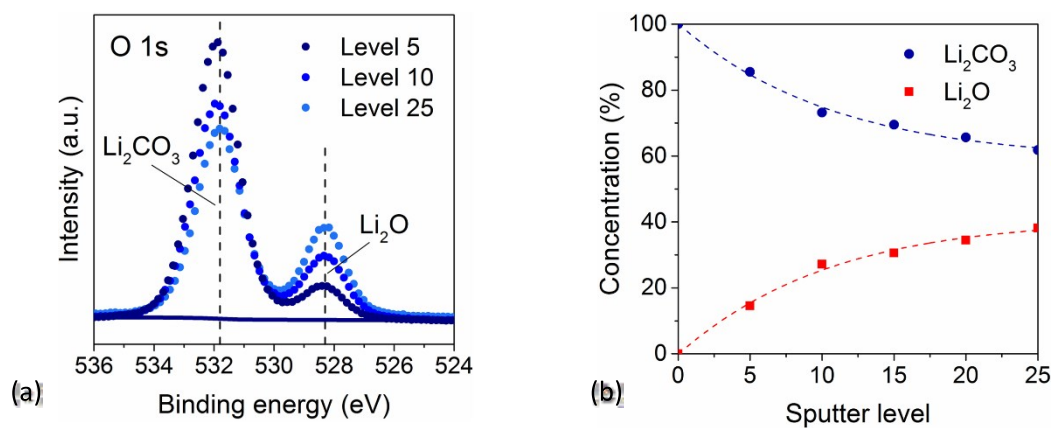


Fig. S 3: (a) XPS O 1s spectrum for an ALD Li_2CO_3 film subject to Ar^+ sputtering. As a result of chemical decomposition, a peak at ~ 528.3 eV appears originating from Li_2O . 25 sputter levels corresponds to removing approximately 30 nm Li_2CO_3 . (b) Decrease in amount of Li_2CO_3 as a function of sputter level obtained from the XPS fitting.

Table S1: *Ex-situ* XPS stoichiometry results for both plasma and thermal ALD Li_2CO_3 films.

Sample	O (at. %)	Li (at. %)	C (at. %)
Stoichiometric Li_2CO_3	50.0	33.3	16.7
Plasma 50	47.7	33.5	18.8
Plasma 150	49.1	33.0	18.0
Plasma 250	48.0	33.7	18.4
Thermal 100	48.1	33.3	18.6
Thermal 150	49.3	33.0	17.7
Thermal 300	48.5	33.8	17.7

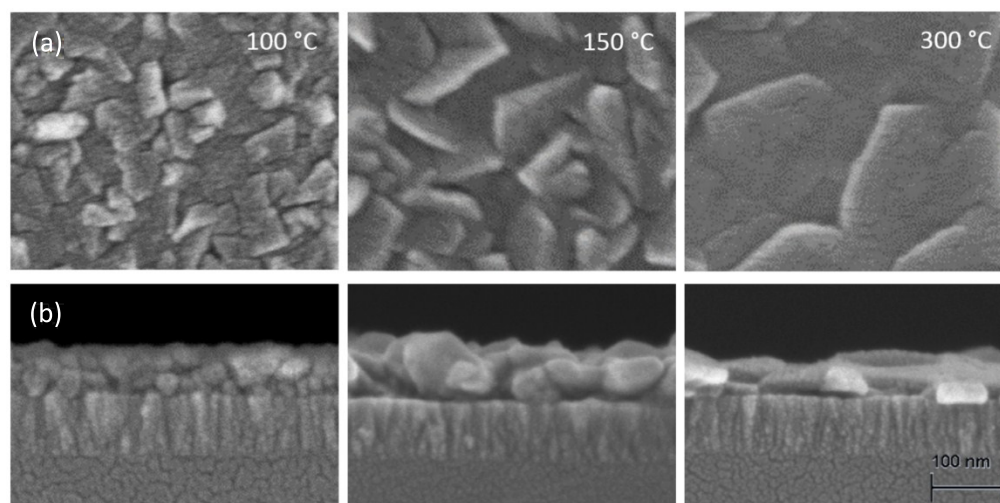


Fig. S 4: (a) High resolution SEM topography and (b) cross-section images of Li_2CO_3 deposited with thermal ALD at 100, 150, and 300 °C. The scale bar applies to all of the pictures.