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Supplemental information

Electronic properties of lithium-ion battery cathodes studied in ion-gated transistor configuration

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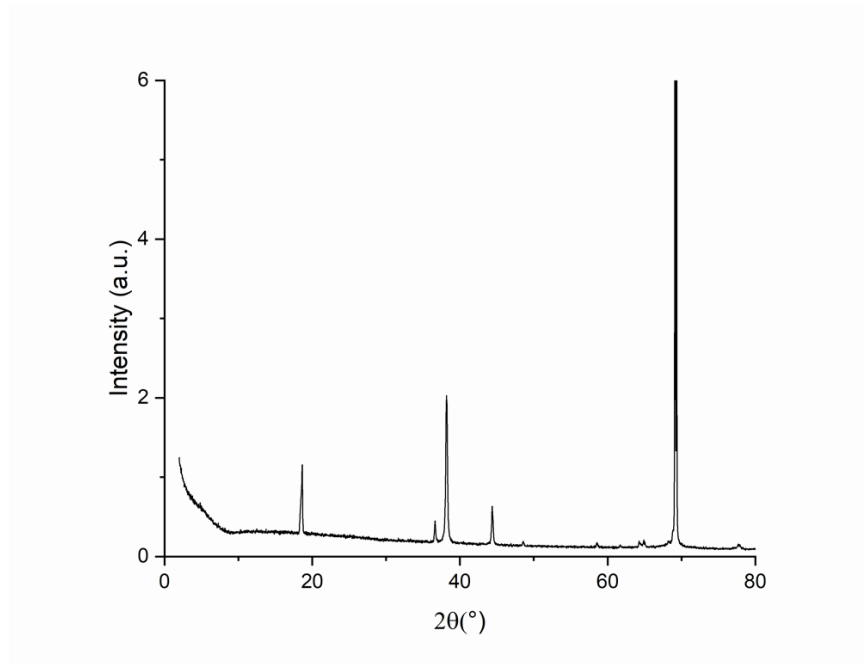


Figure S1. XRD pattern of NMC532 composite deposited on SiO_2/Si . Related to Figure 2 and Figure 3.

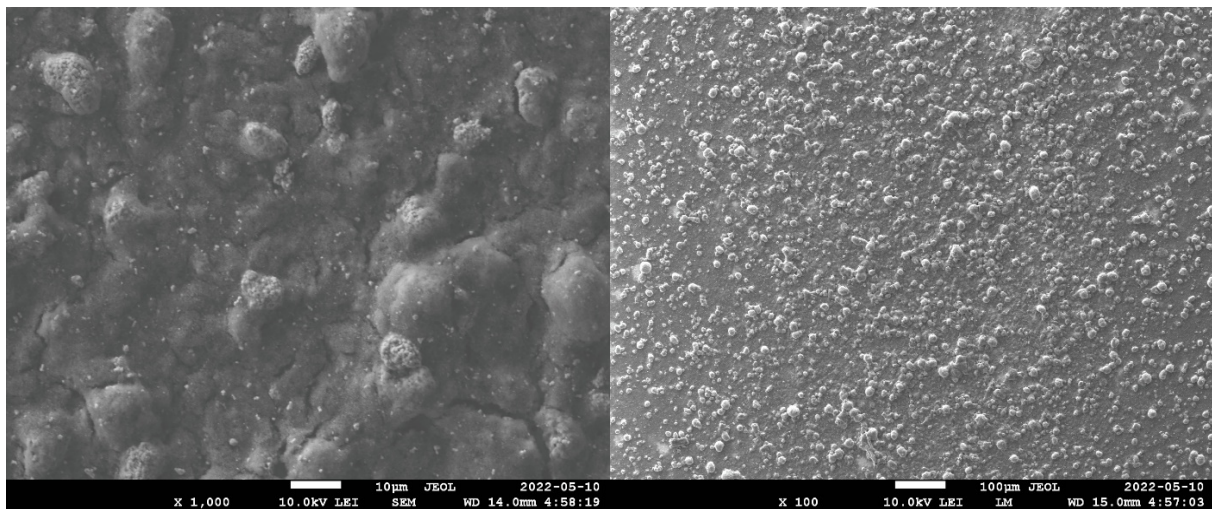


Figure S2. SEM images of NMC532 composite deposited on SiO_2/Si substrate at different magnifications. Related to Figure 2 and Figure 3.

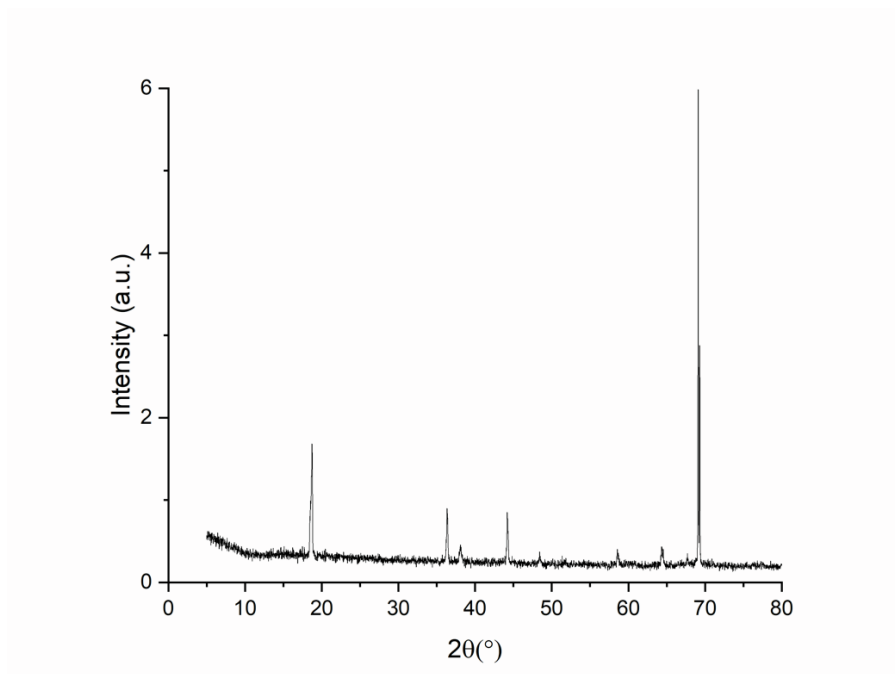


Figure S3. XRD pattern of LNMO composite deposited on SiO_2/Si substrate. Related to Figure 2 and Figure 4.

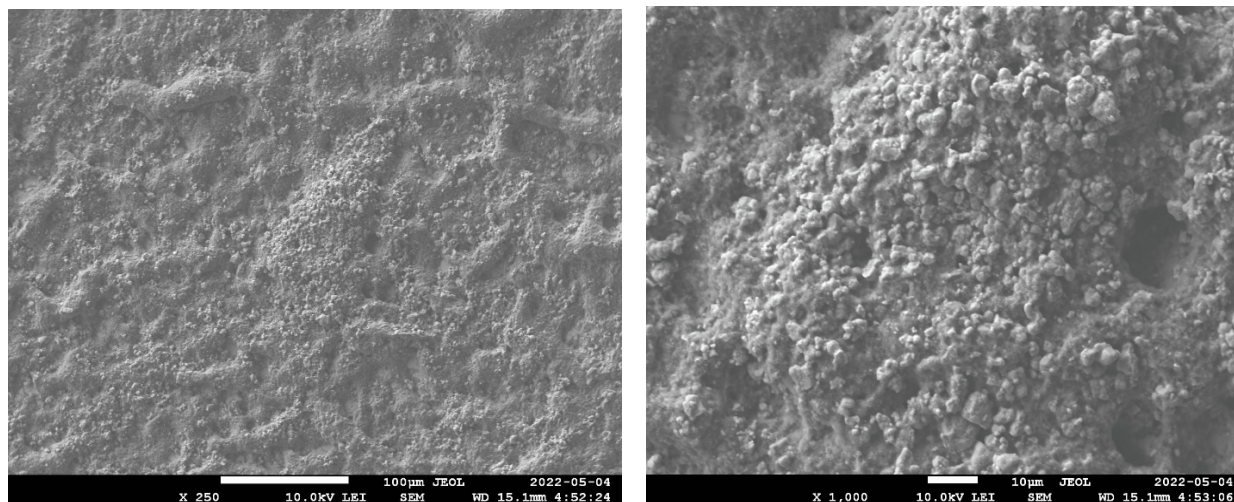


Figure S4. SEM images of LNMO composite deposited on SiO_2/Si substrate at different magnifications. Related to Figure 2 and Figure 4.

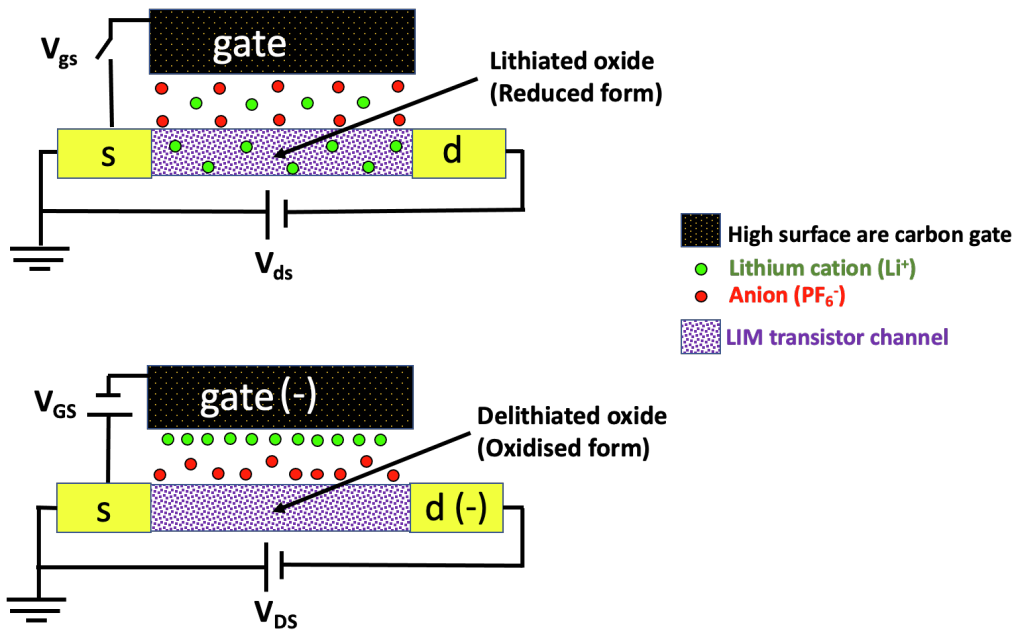


Figure S5. Working principle of the IGT (top) without V_{gs} and (bottom) with V_{gs} bias applied. Before application of V_{gs} , the channel is lithiated (top). When a negative V_{gs} is applied, the channel is delithiated (bottom): Li^+ ions move towards the carbon gate, where an electrical double layer forms at the carbon/electrolyte interface. The value of I_{ds} depends on V_{gs} (i.e. on the state-of-charge of the LIM). Related to Figure 2.

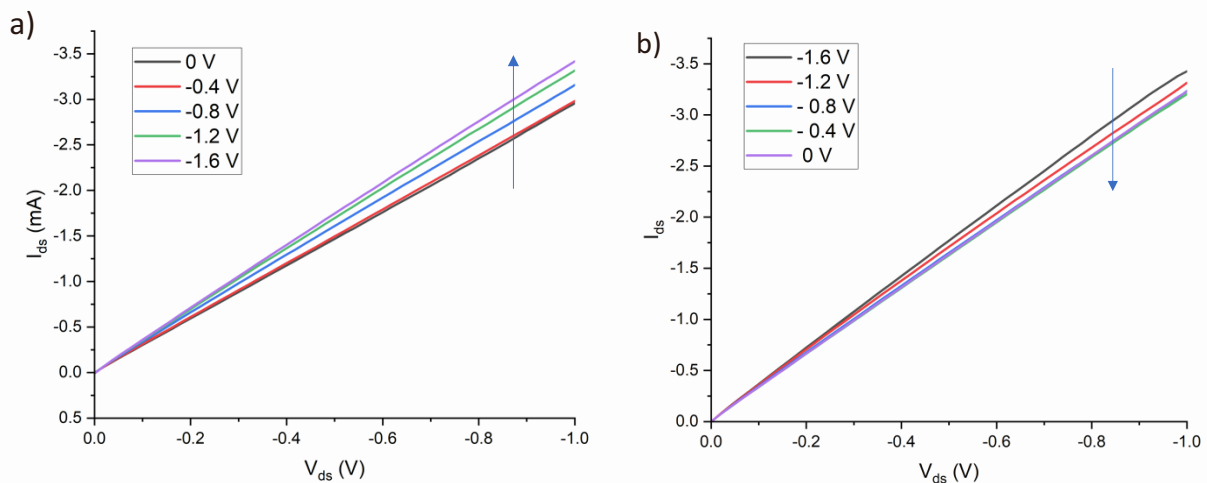


Figure S6. Output curves of NMC532- based IGTs at V_{ds} scan rate of 20 mV s^{-1} for: **a)** forward scan with V_{gs} from 0 to -1.6 V, corresponding to potentials from 3 V to 4.6 V vs Li^+/Li ; **b)** reverse scan with V_{gs} from -1.6 V to 0 V, corresponding to potentials from 4.6 V to 3 V vs Li^+/Li . Related to Figure 2 and Figure 3. Related to Figure 2 and Figure 3.

Table S1. NMC532 composite electronic resistance evaluated from the output tests at different V_{gs} during forward and backward V_{ds} sweeps at 20 mV s^{-1} , reported in Fig. S6. Related to Figure 2 and Figure 3.

V_{gs} (V vs. Li/Li^+)	R (Ω) Forward	R (Ω) Backward
0.0 V (3.0 V vs. Li/Li^+)	340	310
-0.4 V (3.4 V vs. Li/Li^+)	336	312
-0.8 V (3.8 V vs. Li/Li^+)	318	310
-1.2 V (4.2 V vs. Li/Li^+)	302	303
-1.6 V (4.6 V vs. Li/Li^+)	292	290

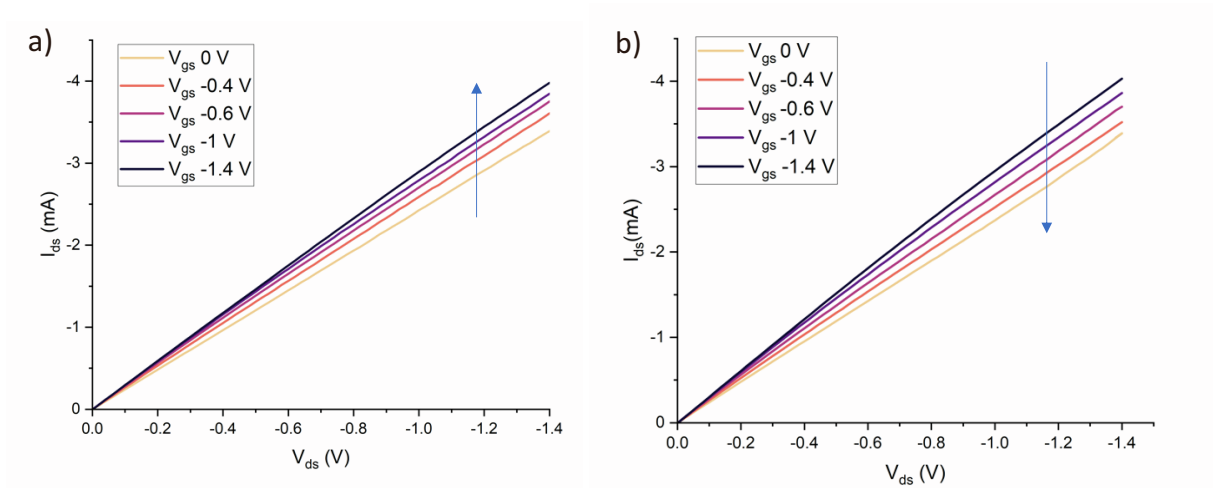


Figure S7. Output curves of LNMO-based IGTs at V_{ds} scan rate of 20 mV s^{-1} for: **a)** forward scan with V_{gs} from 0 to -1.4 V , corresponding to potentials from 3 to 4.4 V vs Li^+/Li ; **b)** reverse scan with V_{gs} from -1.4 to 0 V , corresponding to potentials from 4.4 to 3 V vs Li^+/Li . Related to Figure 2 and Figure 4.

Table S2. LNMO composite electronic resistance evaluated from the output tests at different V_{gs} during forward and backward V_{ds} sweeps at 20 mV s^{-1} , reported in Fig. S7. Related to Figure 2 and Figure 4.

V_{gs} (V vs. Li/Li^+)	R (Ω) Forward	R (Ω) Backward
0.0 V (3.0 V vs. Li/Li^+)	412	417
-0.4 V (3.4 V vs. Li/Li^+)	389	400
-0.6 V (3.6 V vs. Li/Li^+)	375	380
-1.0 V (3 V vs. Li/Li^+)	365	363
-1.4 V (4.4 V vs. Li/Li^+)	351	346