Supplementary Information

N-doped carbon encapsulated ultrathin MoO_3 nanosheets as superior anodes with high capacity and excellent rate capability for Li-ion batteries

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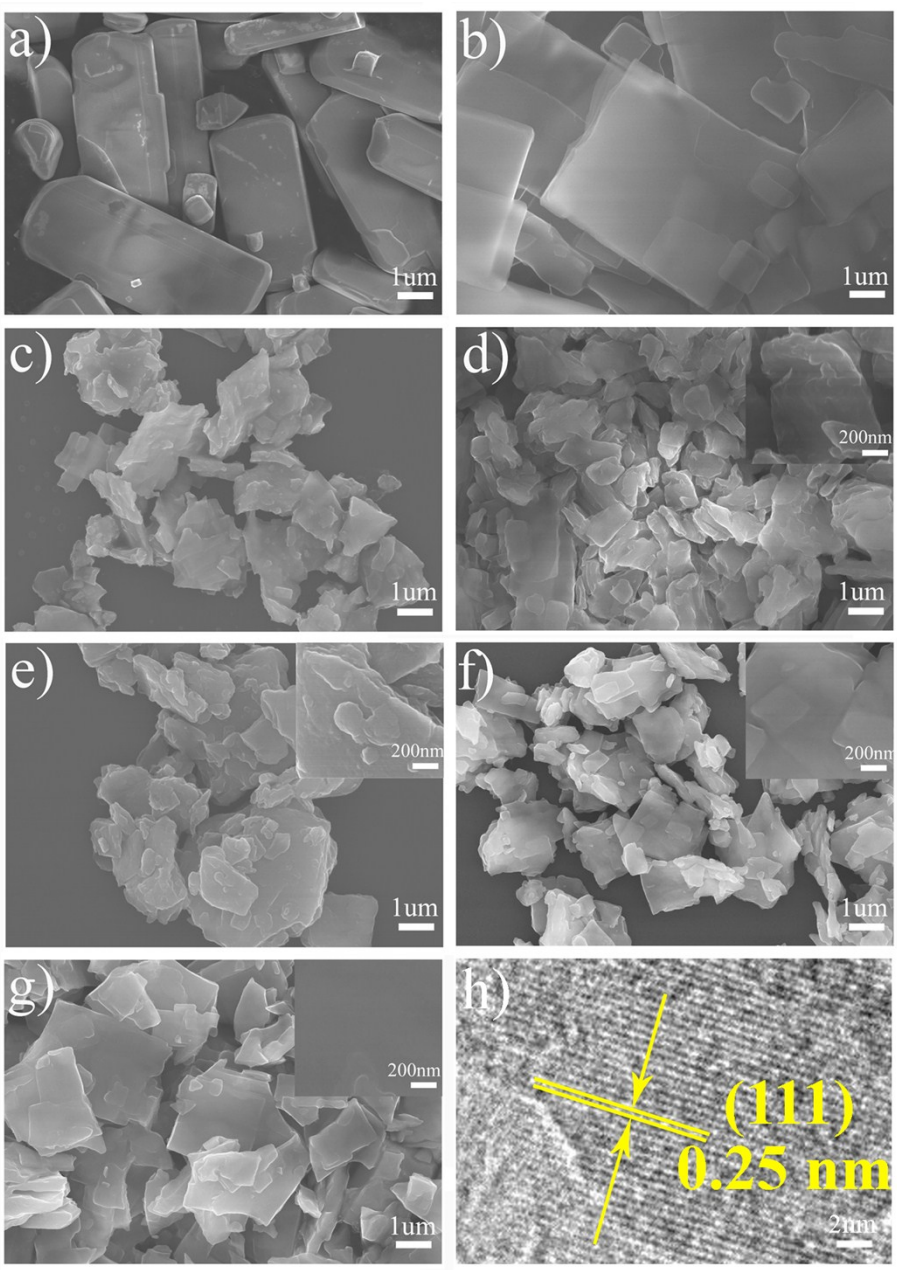


Fig. S1 Typical SEM of (a) α-MoO_3 and (b) MoO_3/dodecylamine. The SEM of (c) M-700, (d) M-200, (e) M-300, (f) M-400 and (g) M-500. (h) The HRTEM image of M-600.

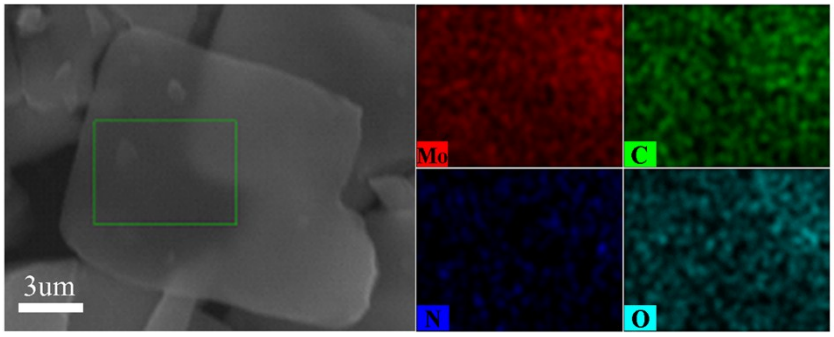
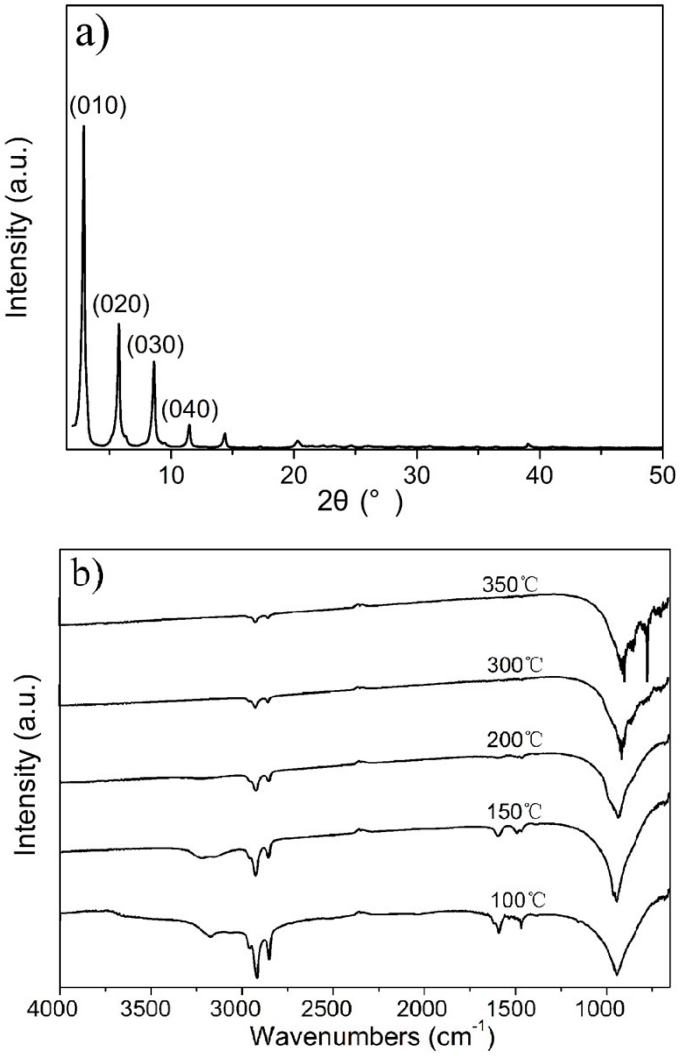


Fig. S2 The local area magnification of elemental mapping from M-600 sample.



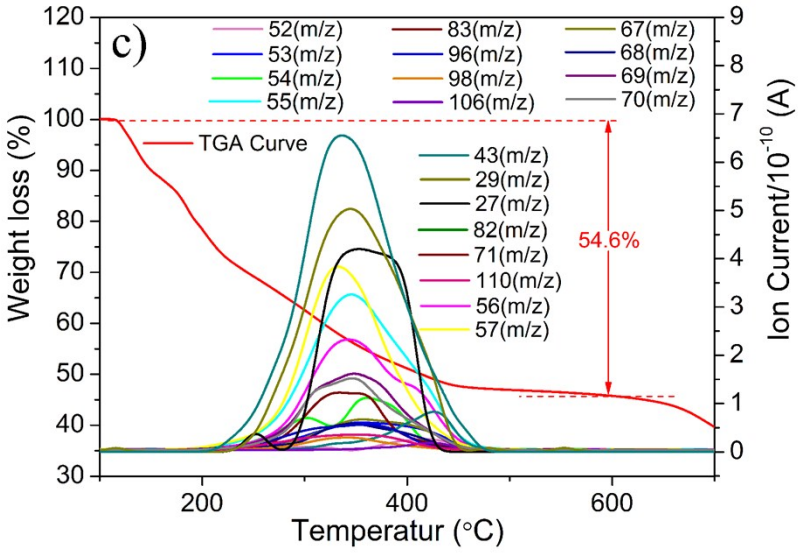


Fig. S3 (a) XRD pattern of precursor MoO_3/dodecylamine. (b) In-situ IR spectrum of composites at various annealing temperature (100~350 °C). (c) TG-MS combination analysis for the calcination of precursor MoO_3/dodecylamine up to 700 °C in argon gas.

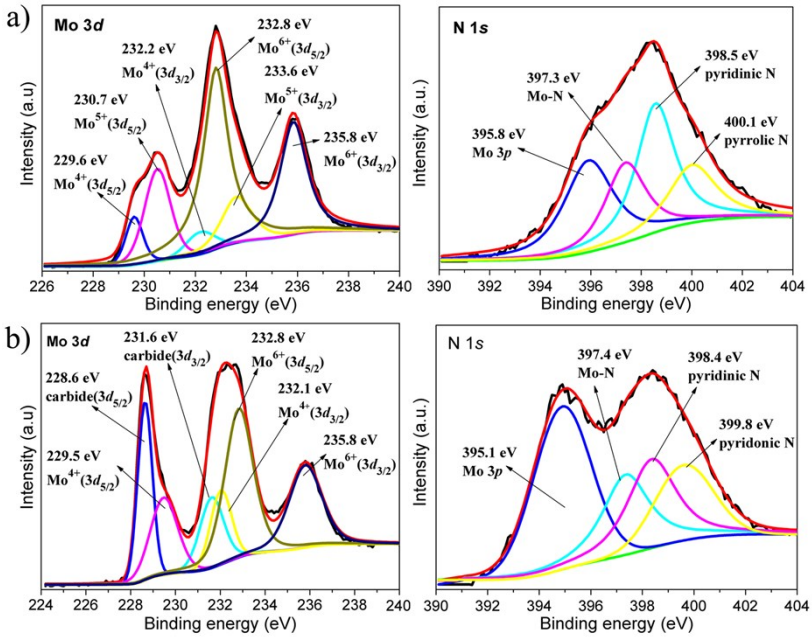


Fig. S4 (a) XPS spectra of M-500 for Mo3*d* and N1*s*. (b) XPS spectra of M-700 for Mo3*d* and N1*s*.

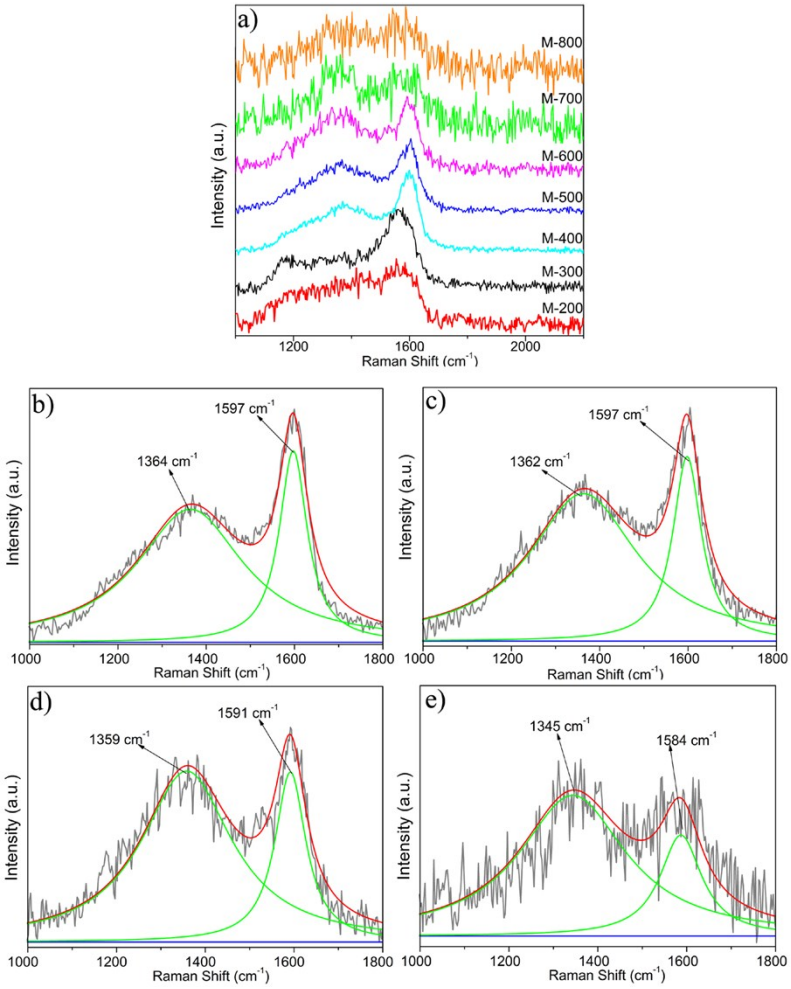


Fig. S5 (a) Raman pattern of different composites after heating treatment at various temperature with a excitation wavelength of 532 nm. The fitted D and G peaks of M-400 (b), M-500 (c), M-600 (d) and M-700 (e).

Table S1 Characteristics of the fitted D and G band for various composites

Samples	D peak position (cm^{-1})	G peak position (cm^{-1})	FWHM of G peak (cm^{-1})	I_D/I_G
M-400	1364	1597	77.1	0.69
M-500	1362	1597	78.4	0.81
M-600	1359	1591	80.1	1.01
M-700	1345	1584	101.8	1.39

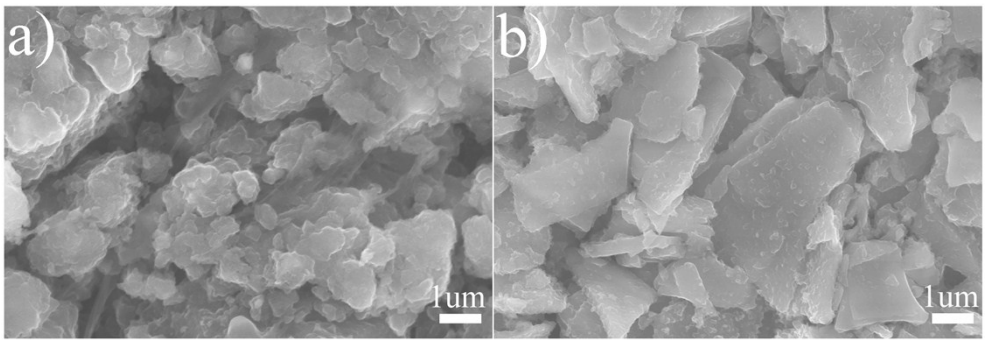


Fig. S6 SEM images of (a) MoO_3 electrode materials and (b) M-600 electrode materials after 60 cycles of charge-discharge at 1C.

Table S2 Comparison for electrochemical properties of various MoO_x materials

Materials	Current rate	Specific capacity (mAh g^{-1})	Cycle number	Ref
MoO_2/graphene	0.2 C	1100	50	1
MoO_3/MnO_2	0.1 C	1127	50	2
	6 C	286	50	
MoO_3 nanosphere	0.1 C	1050	30	3
MoO_3 film	1 C	650	50	4
MoO_2/C nanowires	1 A g^{-1}	327	20	5
MoO_3 microsphere	1 C	780	100	6
MoO_3/C microballs	2 A g^{-1}	733	300	7
MoO_3/C nanofiber	0.2 A g^{-1}	500	100	8
MoO_{3-x} nanowire arrays	0.05 A g^{-1}	630	20	9
Core-shell MoO_2	1 C	624	50	10
Mesoporous MoO_2	0.05 C	750	30	11
MoO_2/C nanosphere	3 C	410	60	11
MoO_2/C nanobelts	0.1 A g^{-1}	617	30	12
MoO_2/MWCNT	0.1 A g^{-1}	1143	200	13
MoO_3@C	1 A g^{-1}	502	100	14
MoO_3@C	0.1 C	1064	50	15
MoO_3@C	0.1 A g^{-1}	500	100	16
MoO_3@C	0.2 C	700	120	17
MoO_3/NC nanosheets	6 C (6.2 A g^{-1})	605	150	Our work
	0.3 C (0.46 A g^{-1})	1250	60	

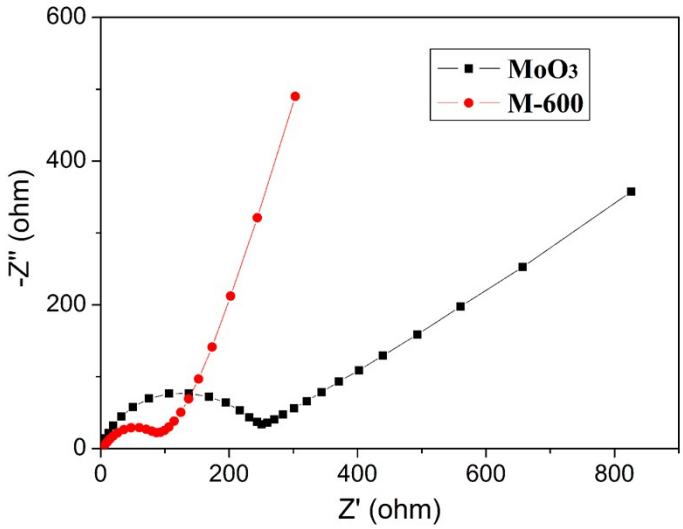


Fig. S7 Nyquist plots of M-600 and MoO_3 over the frequency range from 100 kHz to 0.01 Hz at the discharged potential of 2.5 V after the 15th cycle.

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