Electronic Supplementary Information

a-MoS_3@CNT nanowire cathode for rechargeable Mg batteries: A pseudocapacitive approach for efficient Mg-storage

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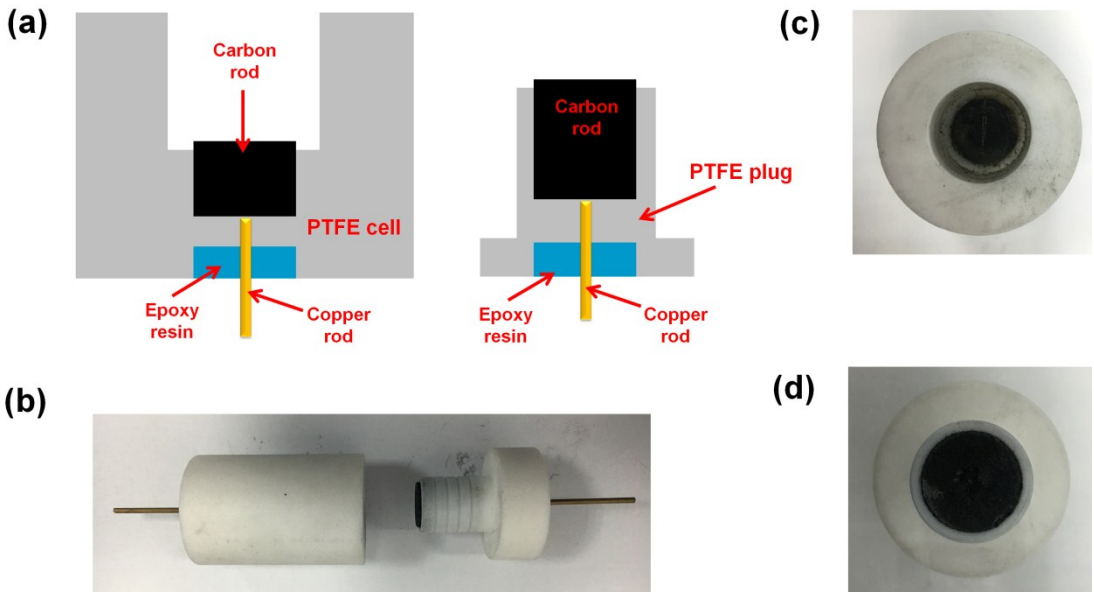

Fig. S1 (a) Schematic drawing and (b, c, d) photos of the lab-made PTFE cell used for Mg battery tests. The cell is made of customer-designed PTFE cell body and carbon rod electrode (with a copper rod inserted in). Epoxy resin is used to fix the carbon electrode and seal the crack. PTFE tape is used for the sealing during the Mg cell fabrication.

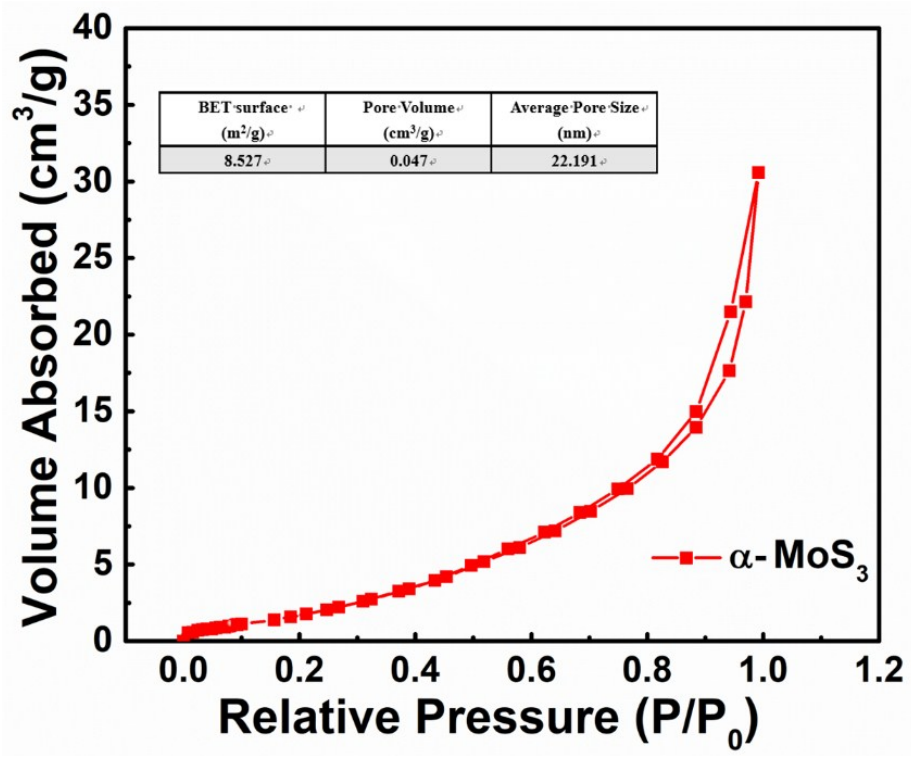

Fig. S2 N_2 adsorption-desorption isotherms of *a*-MoS_3@CNT and corresponding BET analysis results.

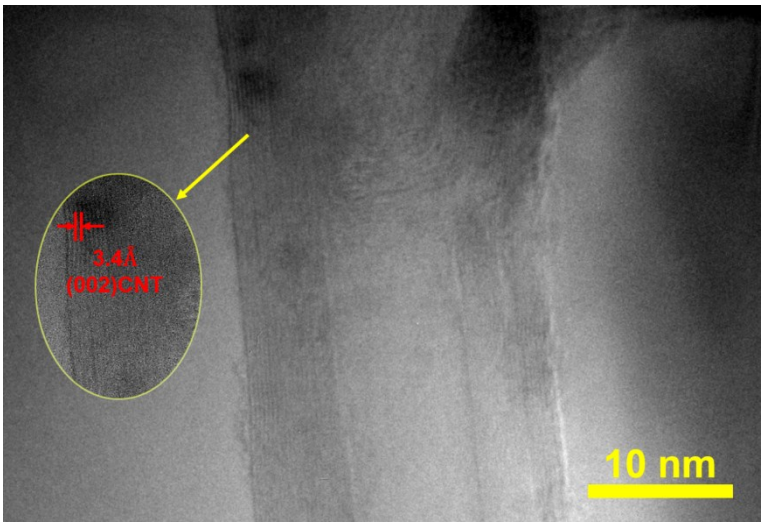

Fig. S3 TEM image of *a*-MoS_3@CNT.

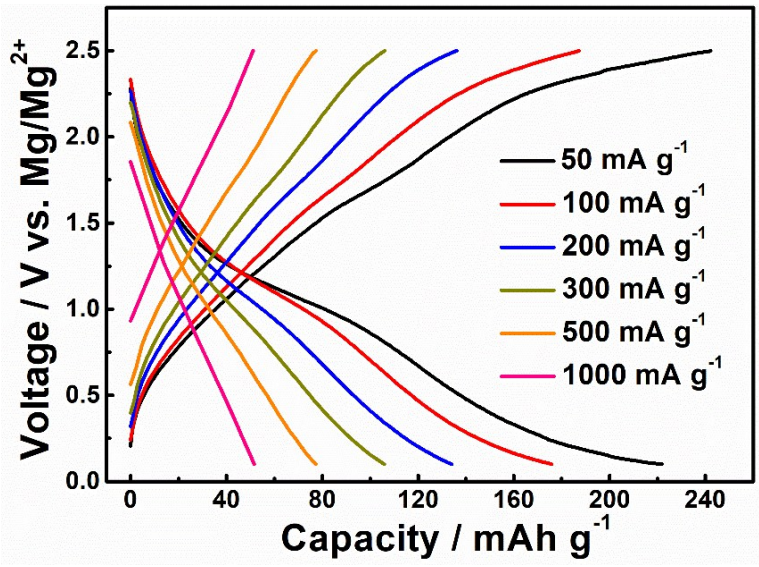

Fig. S4 Discharge/charge profiles of *a*-MoS_3@CNT at different current densities from 50 to 1000 mA g^{-1}.

Table. S1 Summary of representative cathode materials electrochemical performance for Mg batteries reported in recent literature.

Material	Voltage	Capacity	Rate capability	Cycling stability	Ref.
α-MoS_3@CNT	**1.0 V**	**175 mAh g^{-1}**	**225 (50 mA g^{-1}) 175 (100) 135 (200) 105 (300) 80 (500) 50 (1000)**	**500 cycles, 50 mAh g^{-1}**	**This work**
$Cu_2Mo_6S_8$	1.1 V	123 mAh g^{-1}	85 (4 mA g^{-1}) 78 (8) 70 (16) 70 (40) 50 (80) 30 (160)	20 cycles, 85 mAh g^{-1}	1
TiS_2	0.7 V	275 mAh g^{-1}	275 (12 mA g^{-1}) 250 (23.9) 140 (47.8)	20 cycles, 85 mAh g^{-1}	2
peo-MoS_2	0.65 V	82 mAh g^{-1}	70 (5 mA g^{-1}) 62 (10) 55 (25) 44 (50) 38 (100)	30 cycles, 74 mAh g^{-1}	3
Ti_2S_4	1.2 V	200 mAh g^{-1}	200 (12 mA g^{-1}) 195 (23.9) 190 (47.8)	40 cycles, 140 mAh g^{-1}	4
Mn_3O_4	0.8 V	100 mAh g^{-1}	103 (15.4 mA g^{-1}) 84 (30.8) 76 (77) 67 (154) 58 (308) 37.5 (770) 22.5 (1540)	1000 cycles, 63 mAh g^{-1}	5
$K_xMn_8O_{16}$	2.9 V	123 mAh g^{-1}	100 (100 mA g^{-1}) 50 (200)	20 cycles, 180 mAh g^{-1}	6

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