Supporting Information

Petal-like Mn-doped α-$Ni(OH)_2$ nanosheets for high-performance Li–S cathode material

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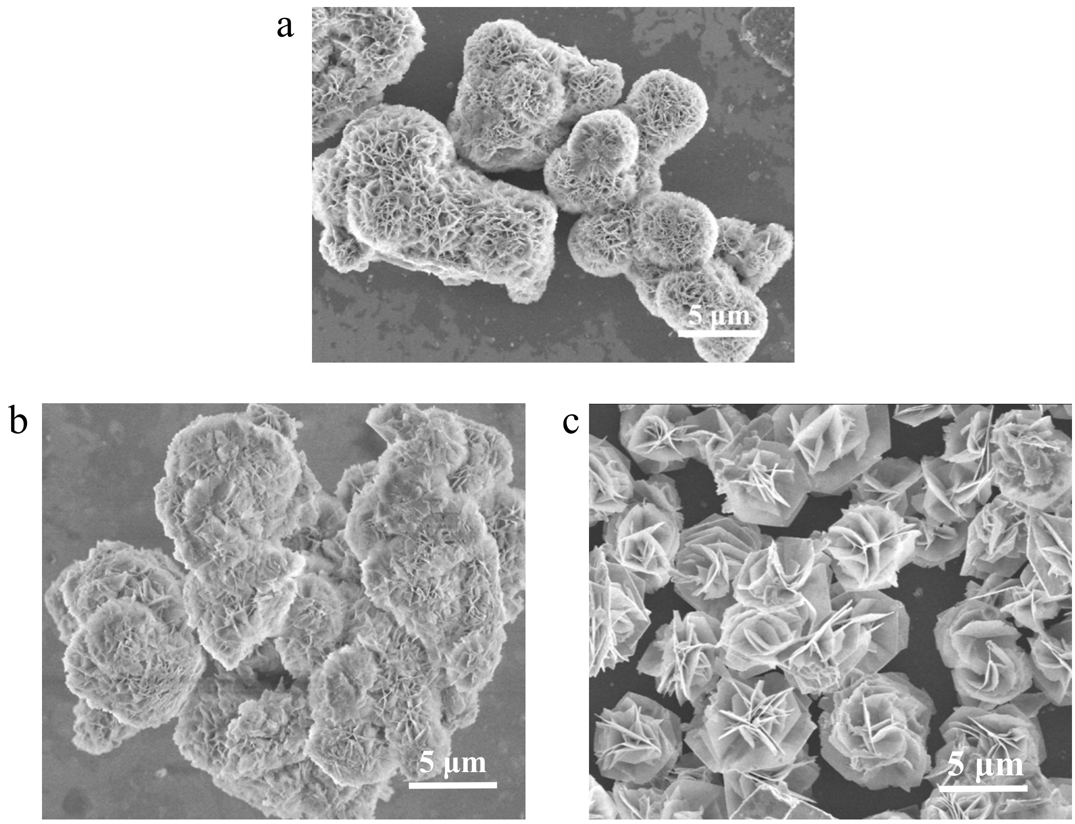

Fig. S1 SEM images of (a) $Ni(OH)_2$, (b) $Ni_{1-x}Mn_x(OH)_2$, and (c) NiMn-LDH at low magnifications.

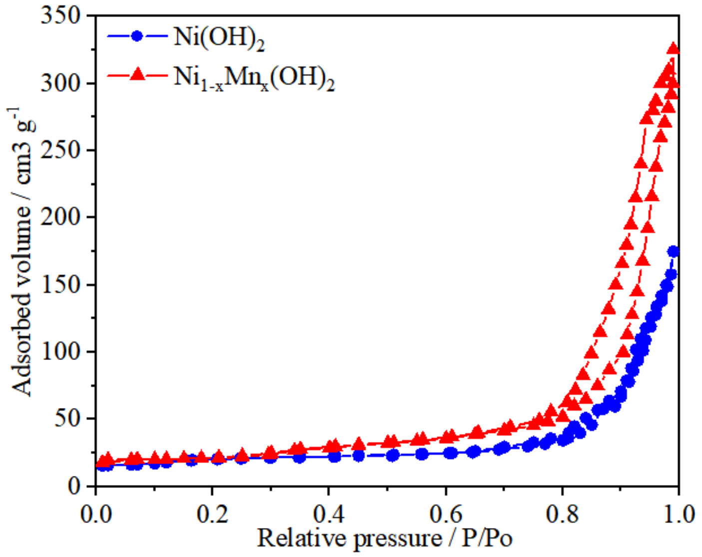

Fig. S2 N_2 adsorption/desorption isotherms of $Ni(OH)_2$ and $Ni_{1-x}Mn_x(OH)_2$.

The polysulfide adsorption tests show that the color of polysulfide (Fig. S3a) changed from dark yellow to transparent after 5 h, indicating that $Ni_{1-x}Mn_x(OH)_2$ has obviously adsorption effect on polysulfide. However, in the case of $Ni(OH)_2$ powder (Fig. S3b), after 5 h, the color of mixture changed from dark yellow to light yellow. The results confirm that the sulfur/polysulfide has a superior adsorption ability by $Ni_{1-x}Mn_x(OH)_2$ host than $Ni(OH)_2$.

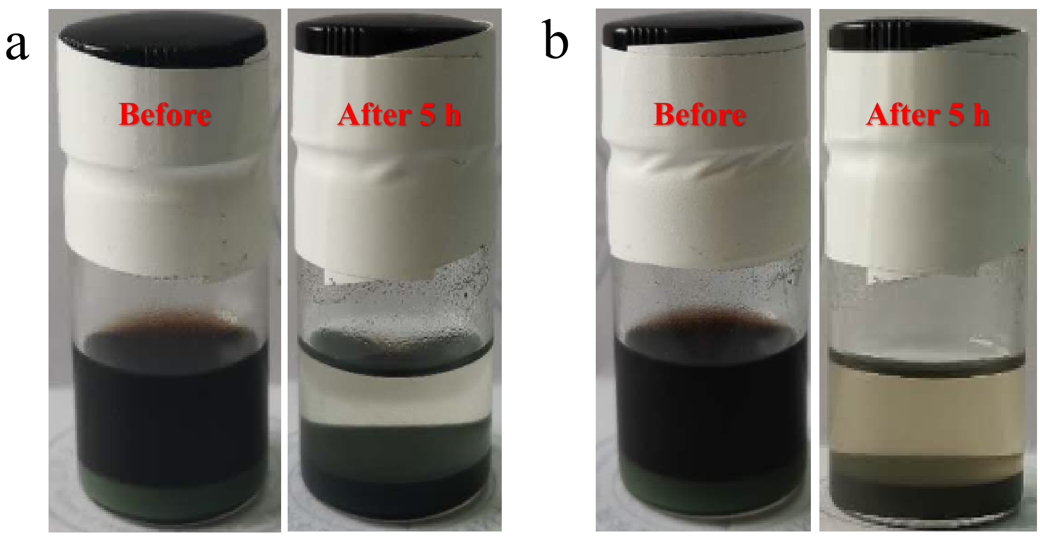

Fig. S3 Adsorption experiment of Li_2S_6 solution a) $Ni_{1-x}Mn_x(OH)_2$, and b) $Ni(OH)_2$.

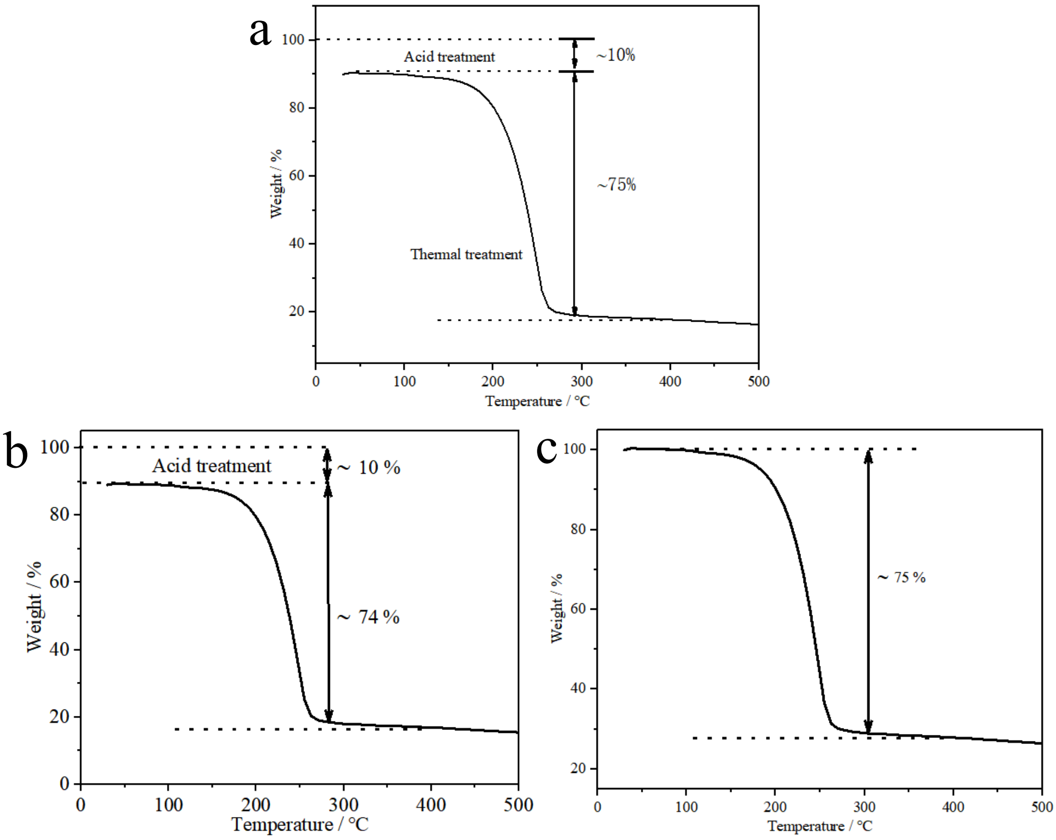

Fig. S4 The TGA profile of (a) $Ni_{1-x}Mn_x(OH)_2$/S/CNT, (b) $Ni(OH)_2$/S/CNT and (c) S/CNT.

Table S1. Comparison of electrochemical performance of this work with some important references in manuscript and previously reported graphene-based Li-S cathodes.

Structure characteristic	Sulfur percentage (by weight)	Initial discharge capacity (C)	Cycle performance (cycles, C)	Ref.
$Ni(OH)_2$@hollow carbon spheres	75 % (～2.1 mg cm^{-2})	961 mAh·g^{-1} (0.5 C)	803 mAh·g^{-1} (200th, 0.5 C)	[S1]
$Ni(OH)_2$@porous carbon/sulfur composites	49.7 % (～3 mg cm^{-2})	1310 mAh·g^{-1} (0.1 C)	720 mAh·g^{-1} (70th, 0.1 C)	[S2]
CNT-assembled dodecahedra core@NH shell	78.4 % (2 mg cm^{-2})	1115 mAh·g^{-1} (0.1 C)	724 mAh·g^{-1} (100th, 0.1 C)	[S3]
Uniform α-$Ni(OH)_2$ hollow spheres	81% (～2.5 mg cm^{-2})	708 mAh·g^{-1} (1 C)	595 mAh·g^{-1} (200th, 1C)	[S4]
NH-Modified Sulfur/Carbon Composite	60 % (～1.5 mg cm^{-2})	897 mAh·g^{-1} (0.2 C)	787 mAh·g^{-1} (100th, 0.2 C)	[S5]
$Ca(OH)_2$-Carbon Framework	63 % (1.2-1.5 mg cm^{-2})	1215 mAh·g^{-1} (0.5 C)	873 mAh·g^{-1} (250th, 0.5 C)	[7]
CB@$Ni(OH)_2$	78.4 % (1.8-2.5 mg cm^{-2})	968 mAh·g^{-1} (0.2 C)	1100 mAh·g^{-1} (150th, 0.2 C)	[8]
Flexible Nanostructured Paper of rGO	44 %	1302 mAh·g^{-1} (0.1 C)	978 mAh·g^{-1} (200th, 0.1C)	[23]
TiC nanoparticles@ GO	66.6 % (～3.5 mg cm^{-2})	1032 mAh·g^{-1} (0.2 C)	670 mAh·g^{-1} (100th, 0.2C)	[24]
CoS_2@GO	66.6 % (～2.9 mg cm^{-2})	1368 mAh·g^{-1} (0.5 C)	1005 mAh·g^{-1} (150th, 0.5C)	[29]
Hollow carbon nanofiber@N-doped porous carbon core-shell composite	77.5 % (1.8-2.5 mg cm^{-2})	1170 mAh·g^{-1} (0.5 C)	590 mAh·g^{-1} (200th, 0.5C)	[32]
self-supporting CoNi@porous N-doped carbon fibers	69.7 %	798 mAh·g^{-1} (5 C)	770 mAh·g^{-1} (1500th, 5C)	[40]
Co_4N/N-doped graphene	77.5 % (4.1 mg cm^{-2})	1109 mAh·g^{-1} (0.5 C)	810 mAh·g^{-1} 150th, 0.5C)	[41]
$Ni_{1-x}Mn_x(OH)_2$	75 % (～5 mg cm^{-2})	1375 mAh·g^{-1} (0.2 C)	813 mAh·g^{-1} (200th, 0.2 C)	This work

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