Electronic Supplementary Material (ESI) for Nanoscale Advances.

Mn_3O_4 nanospheres@rGO architecture with Capacitive Effects on the High Potassium Storage Capability

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Supporting Information

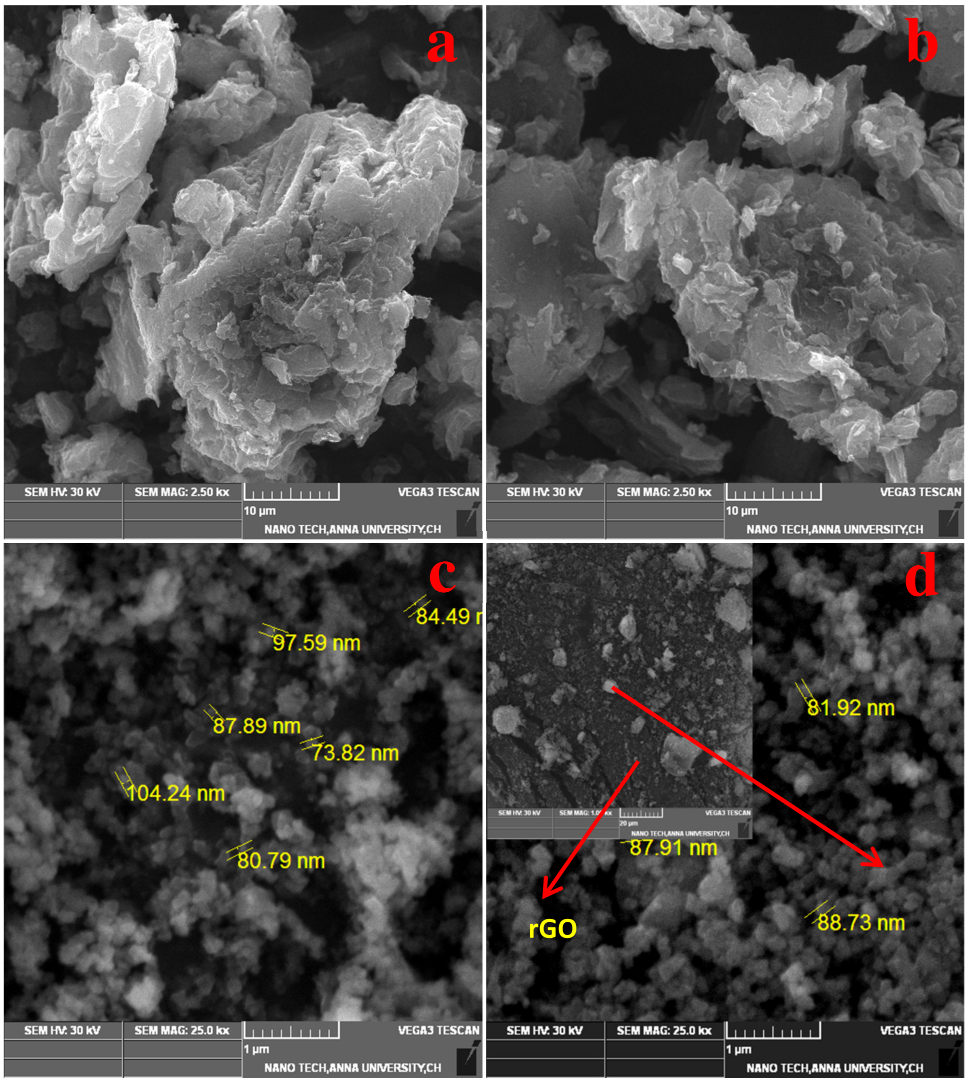

Fig. S1 SEM images of (a) GO (b) rGO (c) Mn_3O_4 (d) Mn_3O_4@rGO (Inset in Fig. d – SEM image of Mn_3O_4@rGO at low magnification).

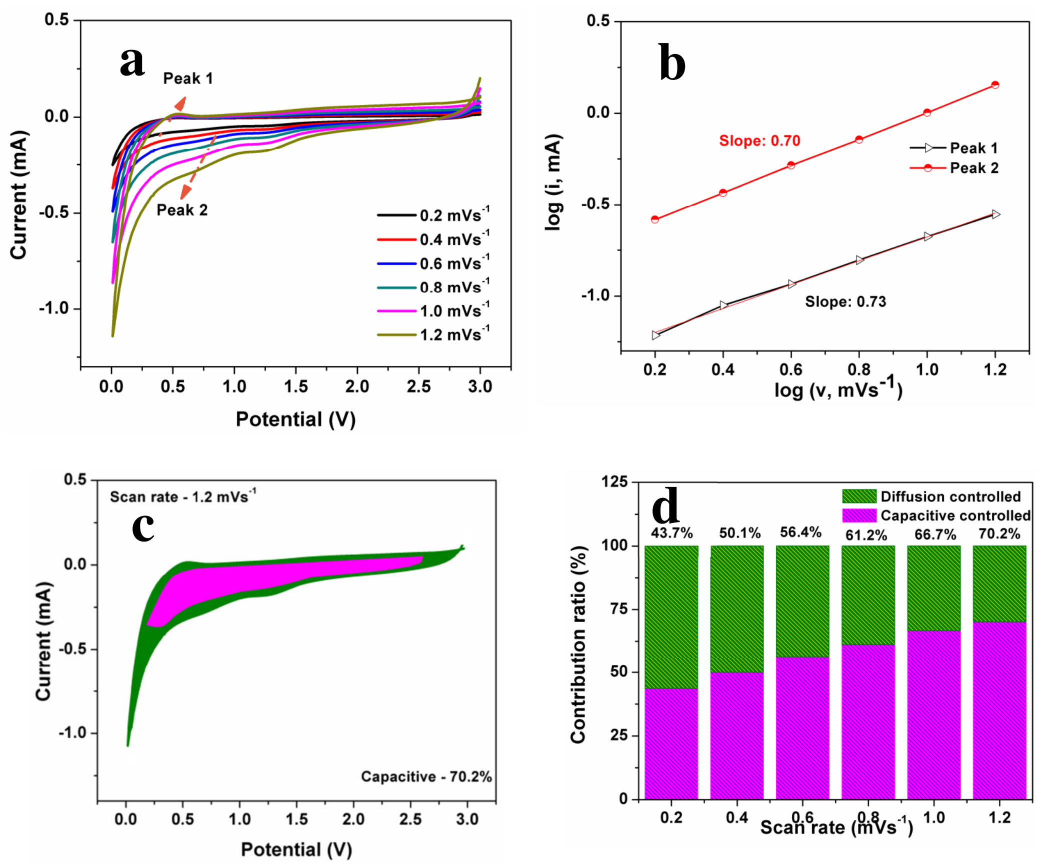

Fig. S2 (a) CV curves of Mn_3O_4 at various scan rates (b) Log i vs. log v plots at oxidation and reduction state (c) Capacitive contribution Mn_3O_4 at 1.2 mVs^{-1} (d) Normalized contribution ratio of capacitive and diffusion controlled capacities of Mn_3O_4 at various scan rates.

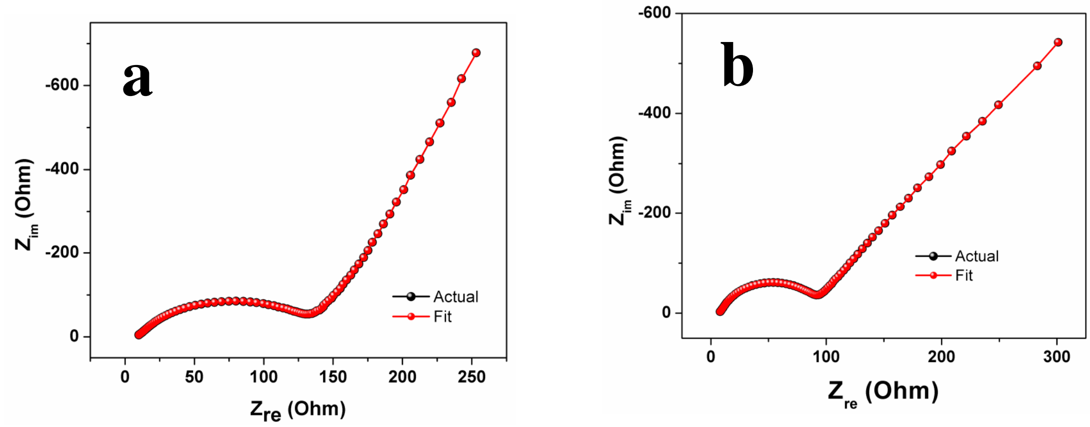

Fig. S3 Actual and fitted Nyquist plots of (a) Mn_3O_4 (b) Mn_3O_4@rGO

Table S1. Comparison of Mn_3O_4 as anode material for LIBs, NIBs and KIBs by various synthesis techniques.

S.No.	Electrode material	Current density (mA/g)	Specific capacity (mAh/g)	Number of cycles	Capacity retention after n^{th} cycle	Reference
1.	Mn_3O_4 microsphere composed of ultrathin nanosheets (Ethanol Thermal reduction Method) for LIBs	100	640	100	95.81	[1]
		2000	324	1000	85.27	
2.	Mn_3O_4 nanoparticles with P_{123} as surfactant (Solvothermal method) for LIBs	100	625.9	75	44.14	[2]
	Mn_3O_4 nanoparticles with HMTA as surfactant (Solvothermal method) for LIBs	100	234.7	75	15.57	
3.	Mn_3O_4/rGO (Two step solution phase reaction) for LIBs	400	780	10	97.50	[3]
		1600	390	10	81.25	
	Pristine Mn_3O_4	40	115	10	41.08	

4.	Sponge like Nanosized Mn_3O_4 (Precipitation method) for LIBs	234	780	40	86.66	[4]
5.	HCF/Mn_3O_4 (HCF was prepared by acid treatment method and HCF/Mn_3O_4 was prepared by insitu synthesis) for LIBs	200	835	100	89.8	[5]
		1000	652	240	66.52	
6.	Mn_3O_4/C microspheres (Solvothermal method) for LIBs	200	1032	500	80	[6]
		1000	848	500	78.16	
		1500	778	500	71.71	
7.	Graphene/Mn_3O_4 (Graphene by Modified Hummer's method and Mn_3O_4 by precipitation method) for LIBs	100	702	100	87.5	[7]
	Mn_3O_4 for LIBs	100	171	100	37.4	
8.	Mn_3O_4 vs LIBs (Selective dissolution method)	50	400	500	41.67	[8]
	Mn_3O_4 vs NIBs	200	167	200	49.86	
	Mn_3O_4 vs KIBs	100	156	100	41.66	
9.	Mn_3O_4@C (Hydrothermal reaction) for LIBs	40	473	50	38	[9]
	Mn_3O_4 for LIBs	40	155	50	15.9	
10.	Mn_3O_4/rGO (6.9wt% of rGO) (Two step chemical reaction) for LIBs	1000	540	100	73.1	[10]
11	**Mn_3O_4@rGO for KIBs (precipitation followed by ultrasonication)**	**500**	**704**	**500**	**90**	**Present work**

References

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Table S2. The fitting results of electrochemical impedance spectroscopy of the rGO, pristine Mn_3O_4 and Mn_3O_4@rGO composite

Material	**R_s (Ω)**	**R_{sf} (Ω)**	**R_{CT} (Ω)**	**C_{dl} (mF)**
rGO	1.10	7.2	133.1	36.7
Mn_3O_4	9.95	20.2	155.3	18.2
Mn_3O_4@rGO	8.04	9.8	92.7	55.2