Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Electronic Supplementary Information

Spinel cobalt-manganese oxide supported on non-oxidized carbon nanotubes as highly efficient oxygen reduction/evolution electrocatalyst

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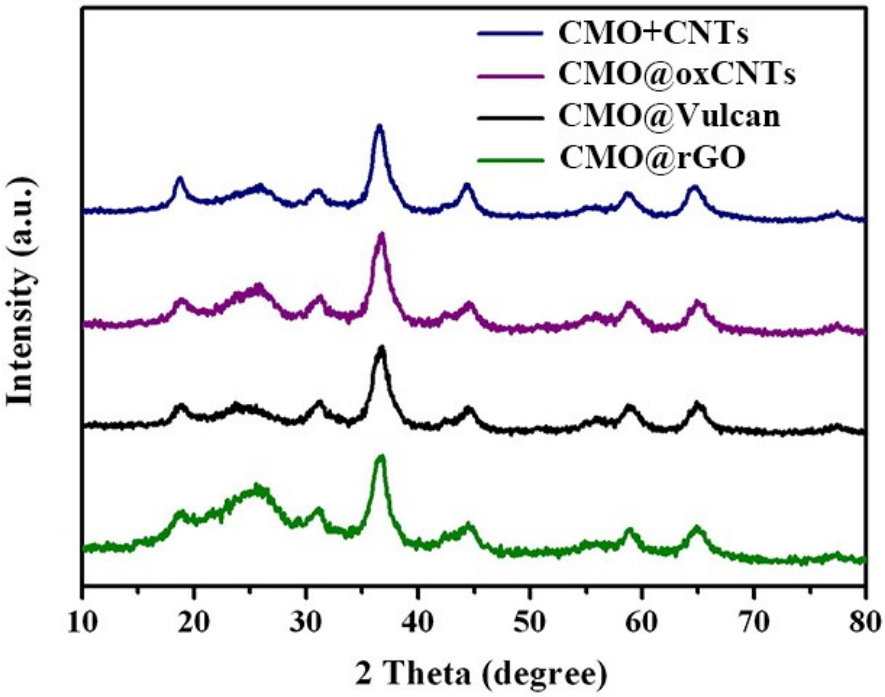

Fig. S1. XRD patterns of CMO+CNT, CMO@oxCNT, CMO@Vulcan and CMO@rGO.

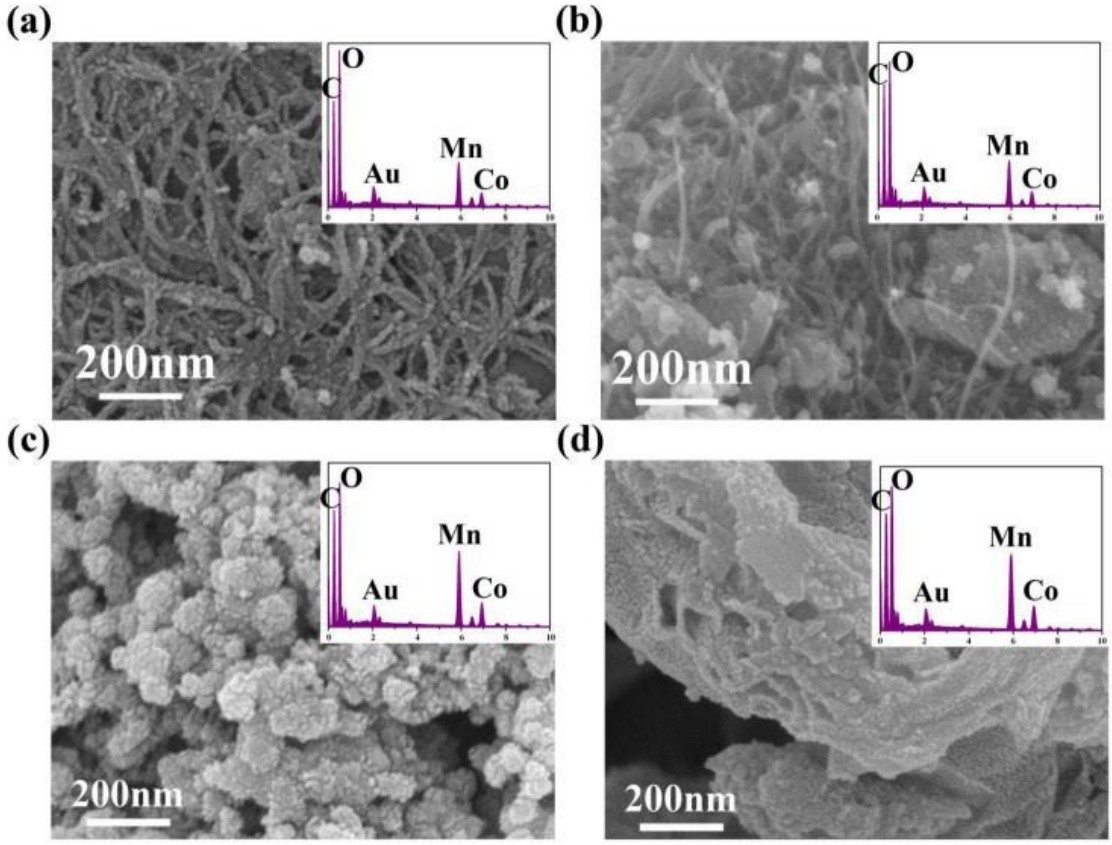

Fig. S2. SEM images of (a) CMO@oxCNT, (b) CMO+CNT, (c) CMO@Vulcan and (d) CMO@rGO. The insets are related EDX spectra.

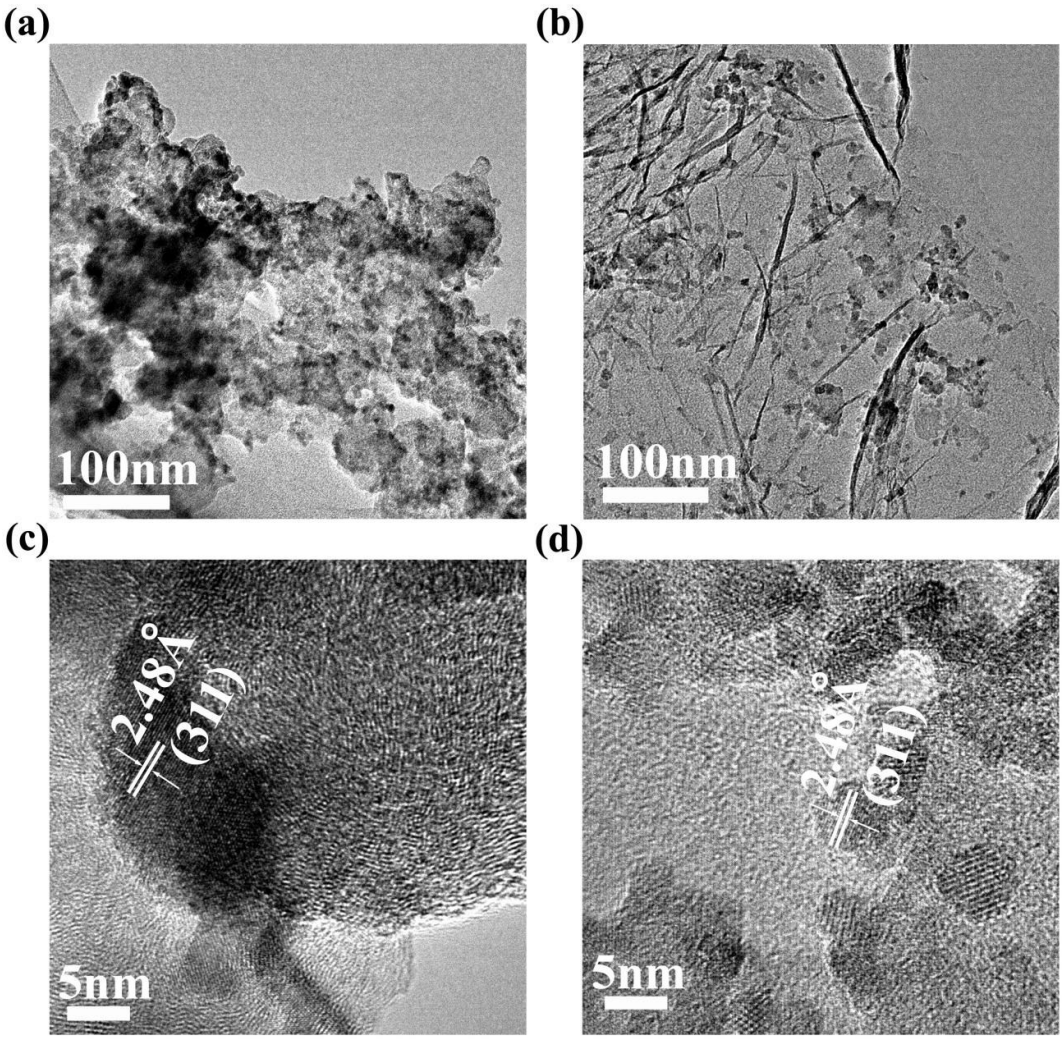

Fig. S3. TEM images of (a) CMO@Vulcan and (b) CMO@rGO. High resolution TEM images of (c) CMO@Vulcan and (d) CMO@rGO.

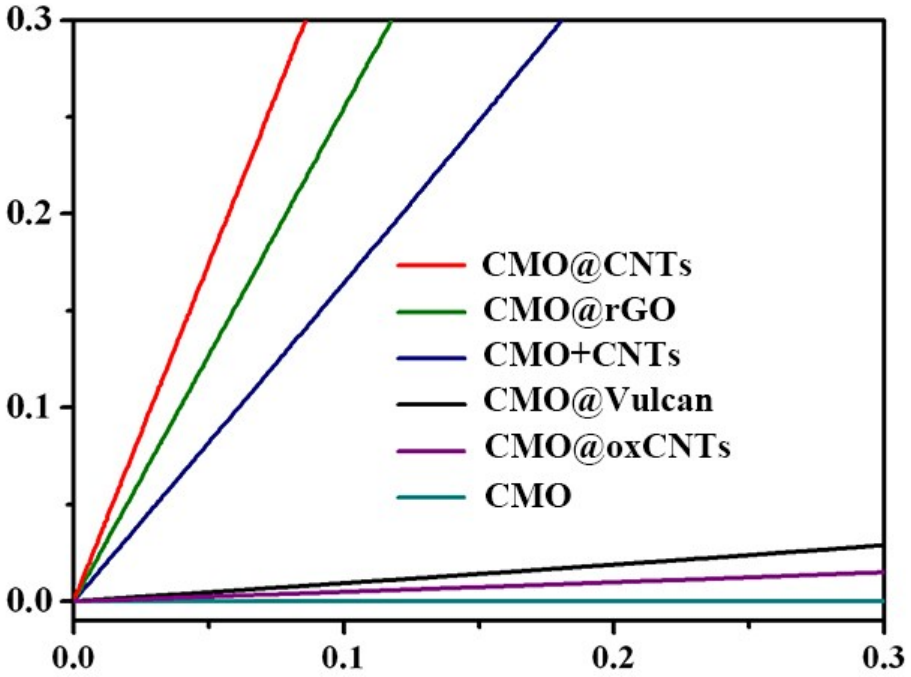

Fig. S4. Current-voltage curves of prepared sample pellets.

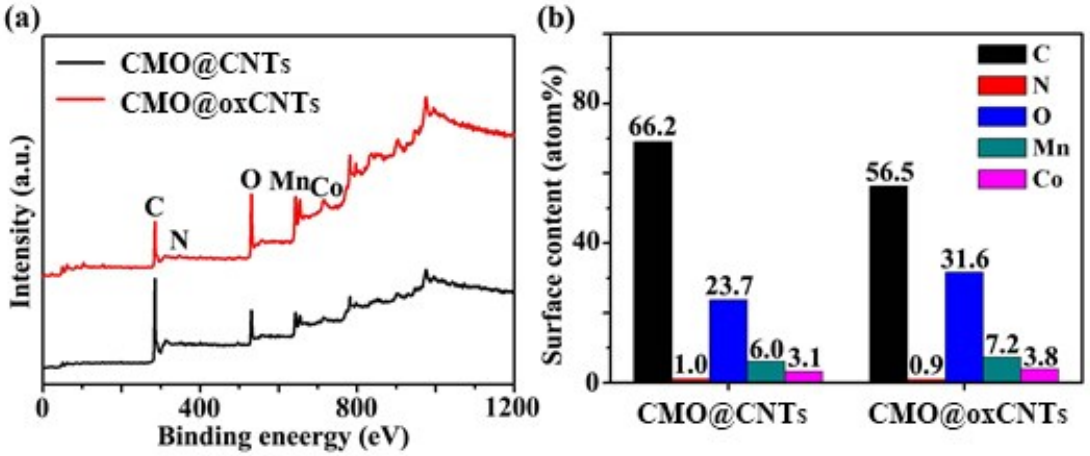

Fig. S5. (a) The XPS full spectra of CMO@oxCNTs and CMO@CNTs. (b) The element content comparison of CMO@oxCNTs and CMO@CNTs.

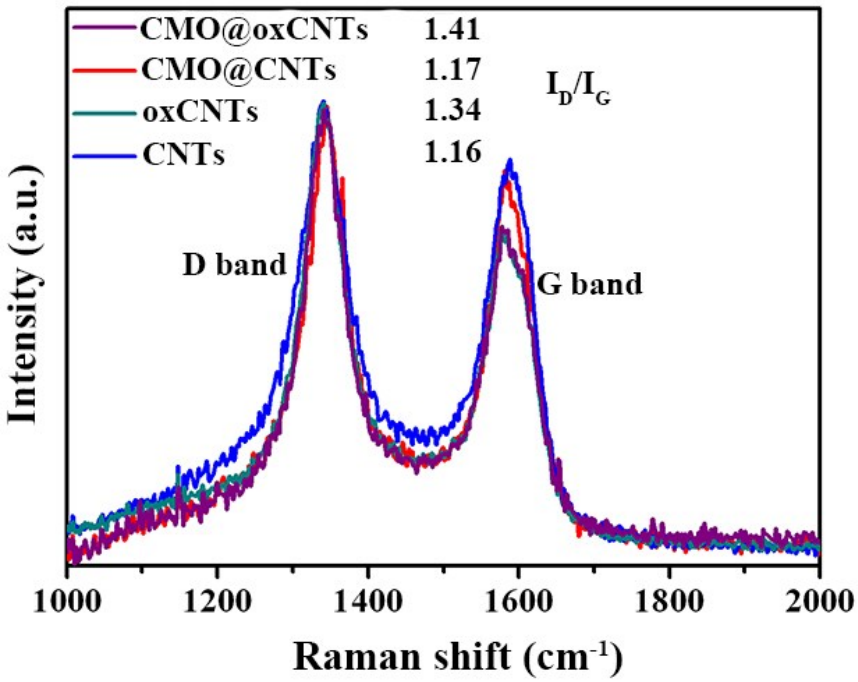

Fig. S6. Raman spectra of CMO@CNTs, CNTs, CMO@oxCNTs, oxCNTs and CMO.

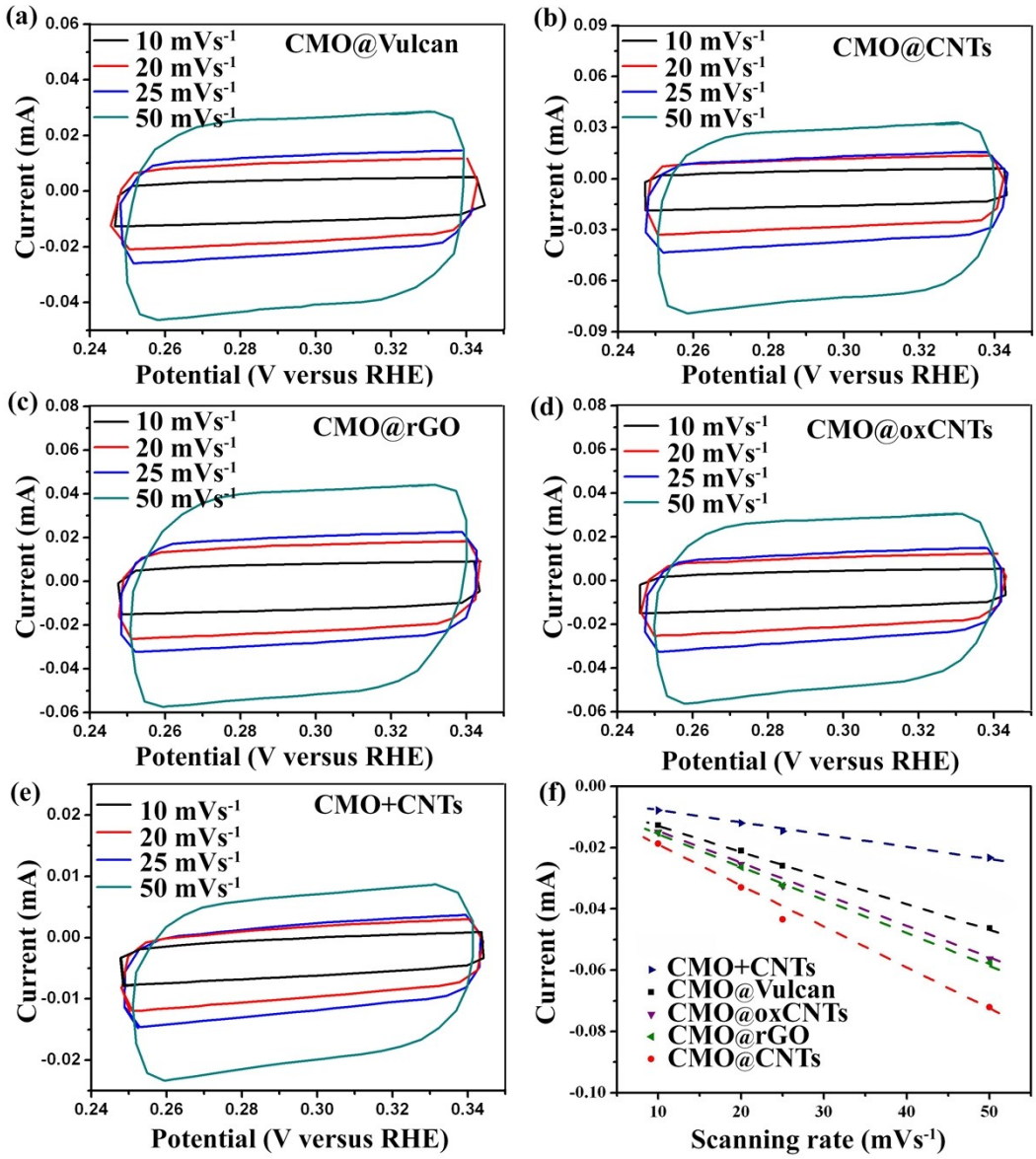

Fig. S7. (a-e) Cyclic voltammograms in non-Faraday reaction region at different scanning rates of prepared samples in Ar-saturated 1 M KOH aqueous solution. (f) The linear fitting of scanning rate dependent currents.

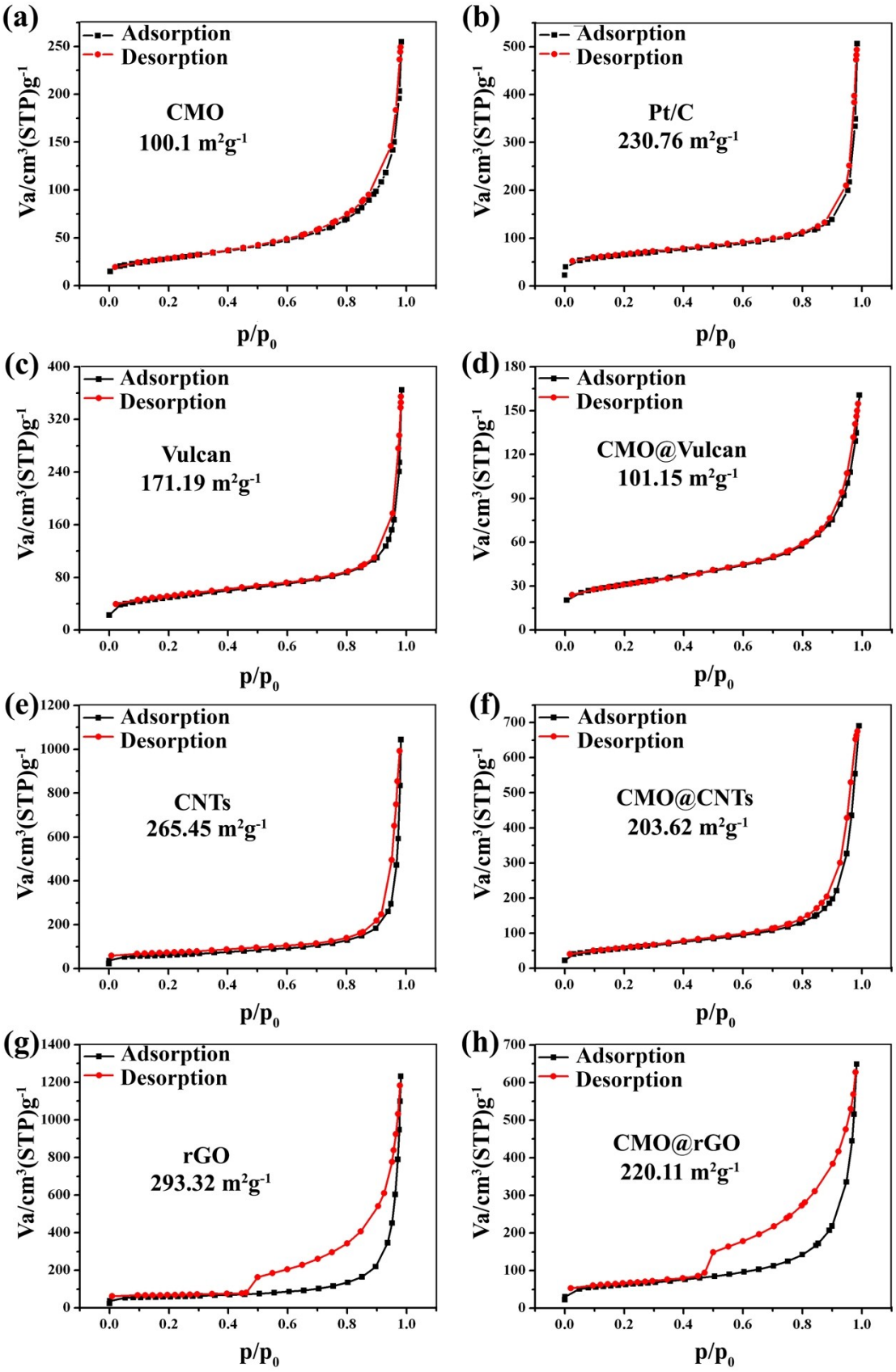

Fig. S8. Nitrogen adsorption/desorption isotherms of prepared samples and Pt/C. The BET specific surface area is shown.

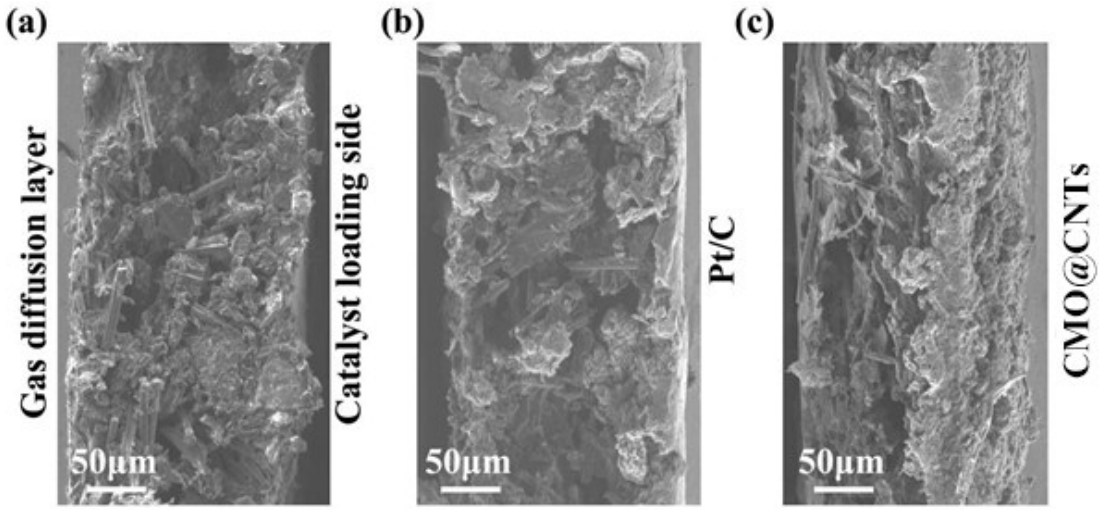

Fig. S9. SEM images of cross section of TCP (a), TCP supporting Pt/C (b) and CMO@CNTs (c).

Table S1. Elemental composition of the prepared samples.

Sample	Co (wt%)	Mn (wt%)	O (wt%)	C (wt%)	H (wt%)	N (wt%)
CMO@CNTs	11.56	21.98	12.79	51.00	0.93	1.74
CMO@Vulcan	11.27	21.88	12.73	51.21	1.16	1.75
CMO@rGO	11.10	22.01	12.81	51.13	1.19	1.76
CMO@oxCNTs	11.48	21.85	23.11	41.30	1.01	1.25

Table S2. Comparison of onset potential, half-wave potential and kinetic current densities.

Sample	E_{onset} (V)	Rotating Speed (rpm)	$E_{half\text{-}wave}$ (V)	I_k (mA/cm^2)	Electrolyte	Reference
CMO@CNTs	0.98	1600	0.91	14.6	1 M KOH	This work
$MnCo_2O_4$/N-rmGO	0.95	1600	0.88	~9.9	1 M KOH	1
CoO/NCNT	0.91	1600	0.85	~3.85	1 M KOH	2
CMO@CNTs	0.97	1600	0.85	4.95	0.1 M KOH	This work
Co_3O_4/N-rmGO	0.93	1600	0.82	~2.14	0.1 M KOH	3
c-$CoMn_2$/C	0.95	1600	0.83	3.58	0.1 M KOH	4
Nanostructured Mn Oxide	~0.86	1600	~0.75	~0.56	0.1 M KOH	5
$CaMnO_3$ microsphere	0.96	1600	0.76	1.39	0.1 M KOH	6
$CoMn_2O_4$/rGO-2.3nm	0.95	1600	~0.83	~4.2	0.1 M KOH	7

References:

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