Electronic Supplementary Information

Ultrafine N-doped Carbon Nanoparticles with Controllable Size to Enhance Electrocatalytic Activity for Oxygen Reduction Reaction

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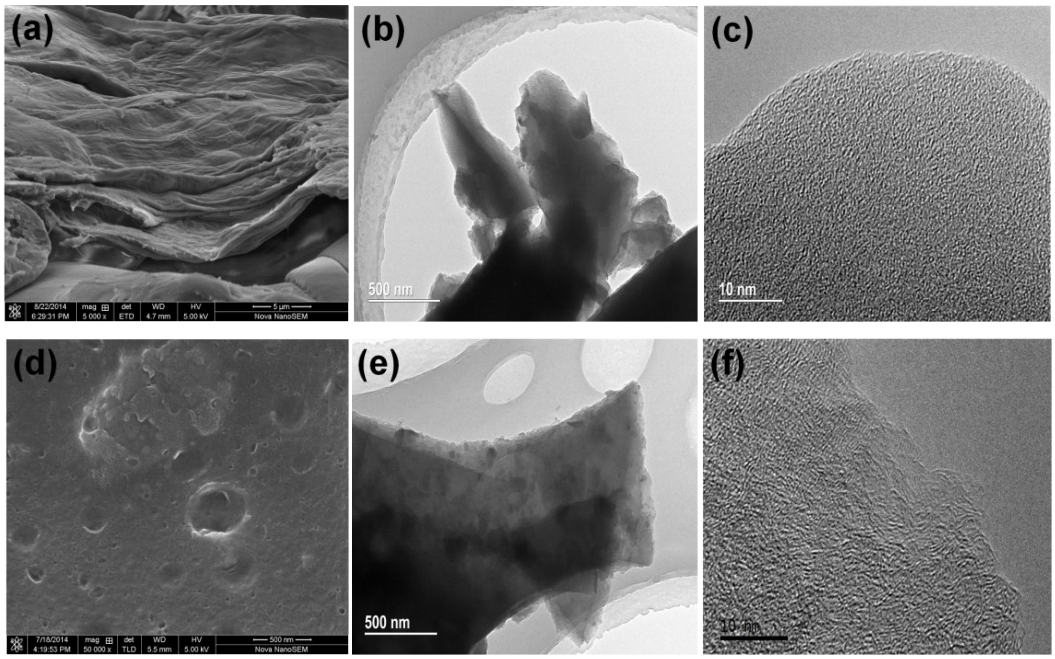

Fig. S1 SEM images of (a) raw sterculia scaphigera; (d) dried sterculia scaphigera after water absorption; TEM images of (b) R-900 and (e) A-900 sample; HR-TEM images of (b) R-900 and (d) A-900 sample

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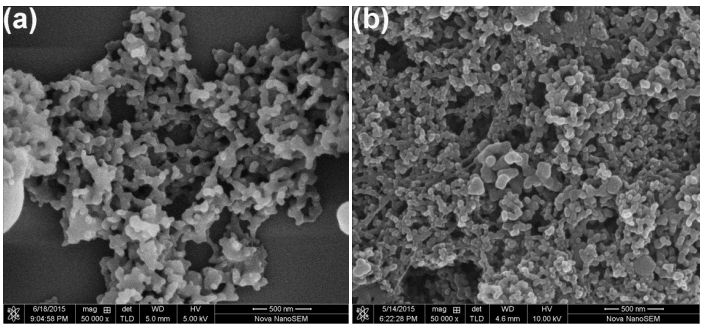

Fig. S2 SEM images of species obtained from (a) 6 h and (b) 18 h hydrothermal treatment.

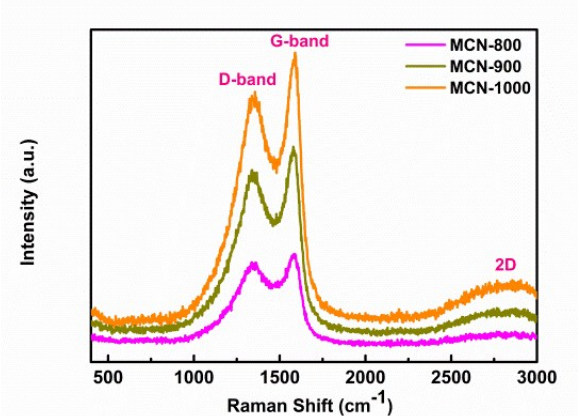

Fig. S3 Raman spectrum of MCNs prepared from different temperature treatment

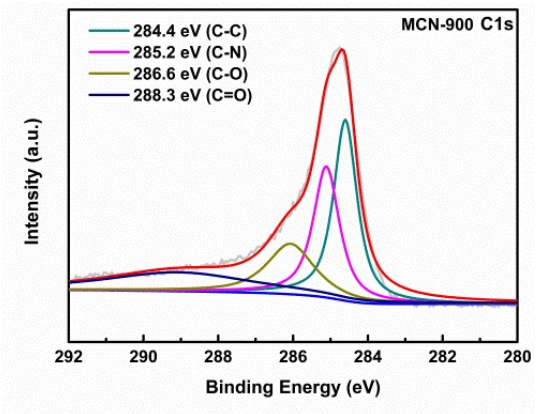

Fig. S4 High resolution C1s XPS scan of MCN-900.

Electrochemical performance

Alkaline media

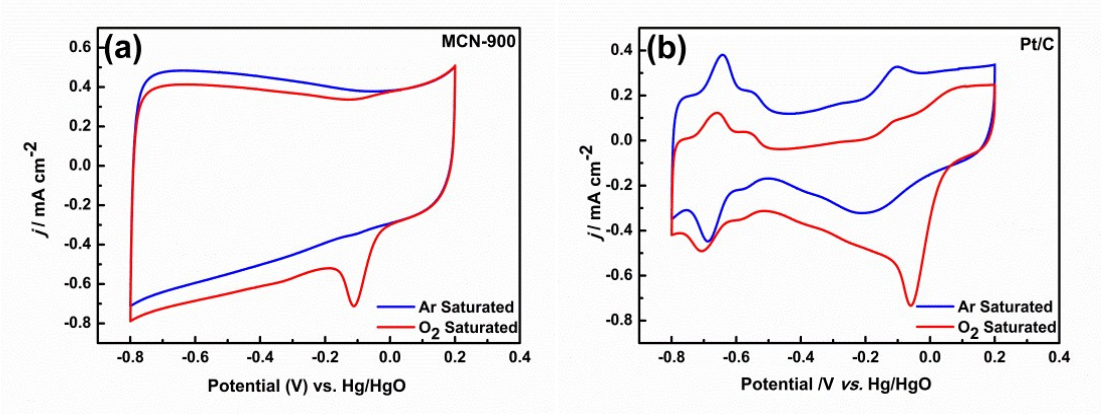

Fig. S5 CV curves of (a) MCN-900 and (b) commercial 20% Pt/C at a scan rate of 10 mV s^{-1} 0.1 M KOH solution.

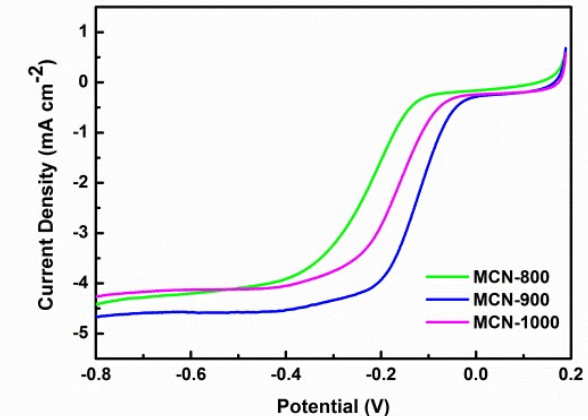

Fig. S6 LSV comparative curves of samples obtained from carbonization at different temperature in alkaline media.

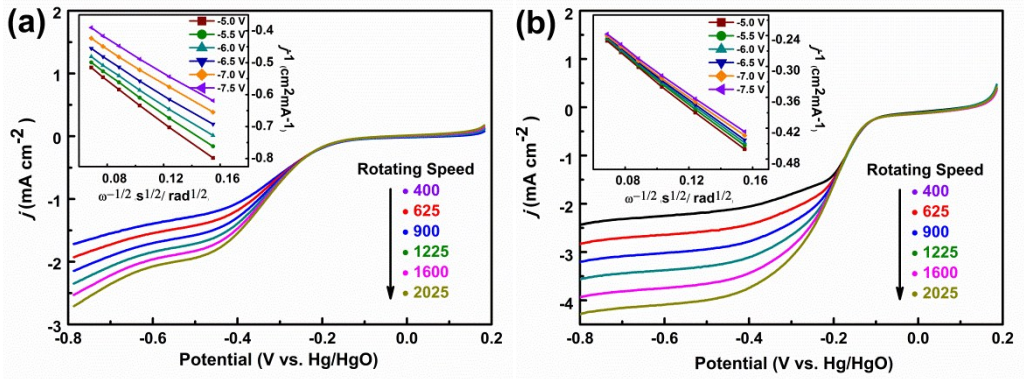

Fig. S7 LSV and K-L curves of (a) R-900 and (b) A-900 with different rotation rates in alkaline solution, respectively.

Acidic media

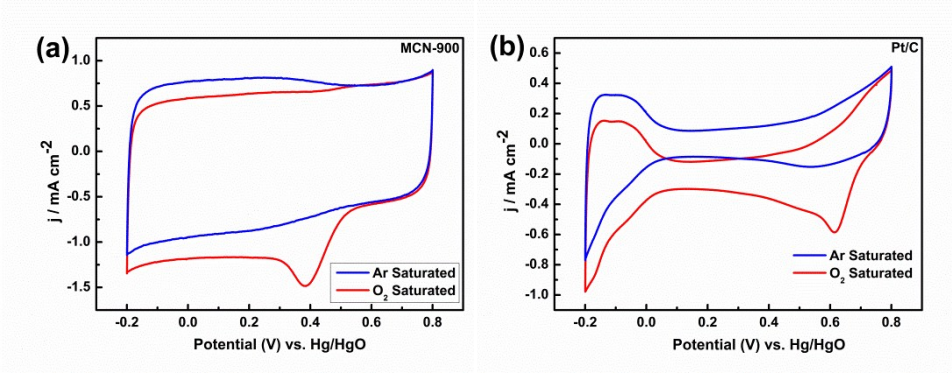

Fig. S8 CV curves of (a) MCN-900 and (b) commercial 20% Pt/C at a scan rate of 10 mV s^{-1} in 0.1 M HClO4 aqueous solution.

Table S1 Summary of textural parameters obtained from nitrogen adsorption analysis.

Sample	S_{BET} (m^2 g^{-1})	Total pore Volumes (cm^3 g^{-1})	Micropore Volumes (cm^3 g^{-1})	S_{BET}-Micro (m^2 g^{-1})
R-900	2.19	-	-	-
A-900	228.85	0.916	0.203	140.56
MCN-800	366.49	0.616	0.156	110.07
MCN-900	353.87	0.510	0.105	113.8
MCN-1000	367.27	0.439	0.113	287.75

Table S2 Surface chemical composition from XPS of all products

Catalyst	Species (at%)		
	C	N	O
R-900	71.06	1.3	22.75
A-900	89.81	2.92	7.27
MCN-800	88.31	5.46	6.24
MCN-900	87.76	5.89	6.36
MCN-1000	89.71	4.04	6.25