Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Electronic Supporting Information

RuO_2-ReO_3 composite nanofibers for efficient electrocatalytic responses

Yu Lim Kim[a,e], Hyun-A Choi[a,e], Nam-Suk Lee[b], Byungrak Son[c], Hee Jun Kim[d], Jeong Min Baik[d],

Youngmi Lee[a], Chongmok Lee[a]*, and Myung Hwa Kim[a]*

[a]*Department of Chemistry & Nano Science, Ewha Womans University, Seoul, 120-750, Korea*

[b]*National Center for Nanomaterials Institute (NCNI), Pohang University of Science and Technology (POSTECH), Pohang, 790-784, Korea*

[c]*Robotic Research Division, Daegu Gyeongbok Institute of Science & Technology (DGIST), Dalseong, 711-873, Korea*

[d]*School of Mechanical and Advanced Materials Engineering, Ulsan National Institute of Science and Technology (UNIST), Ulsan, 698-805, Korea*

[e]*Authors are equally contributed to this work.*

*To whom all correspondence should be addressed: myungkim@ewha.ac.kr, cmlee@ewha.ac.kr

Fig. S1

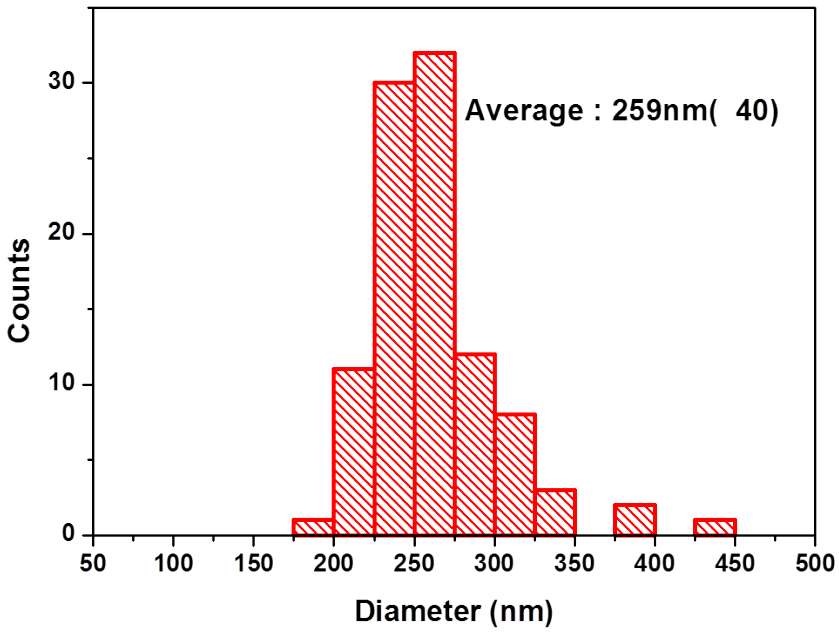

Fig. S1 Histogram of the size distribution of the RuO_2-ReO_3(0.11) composite nanofibers after thermal annealing at 400°C in air.

Fig. S2

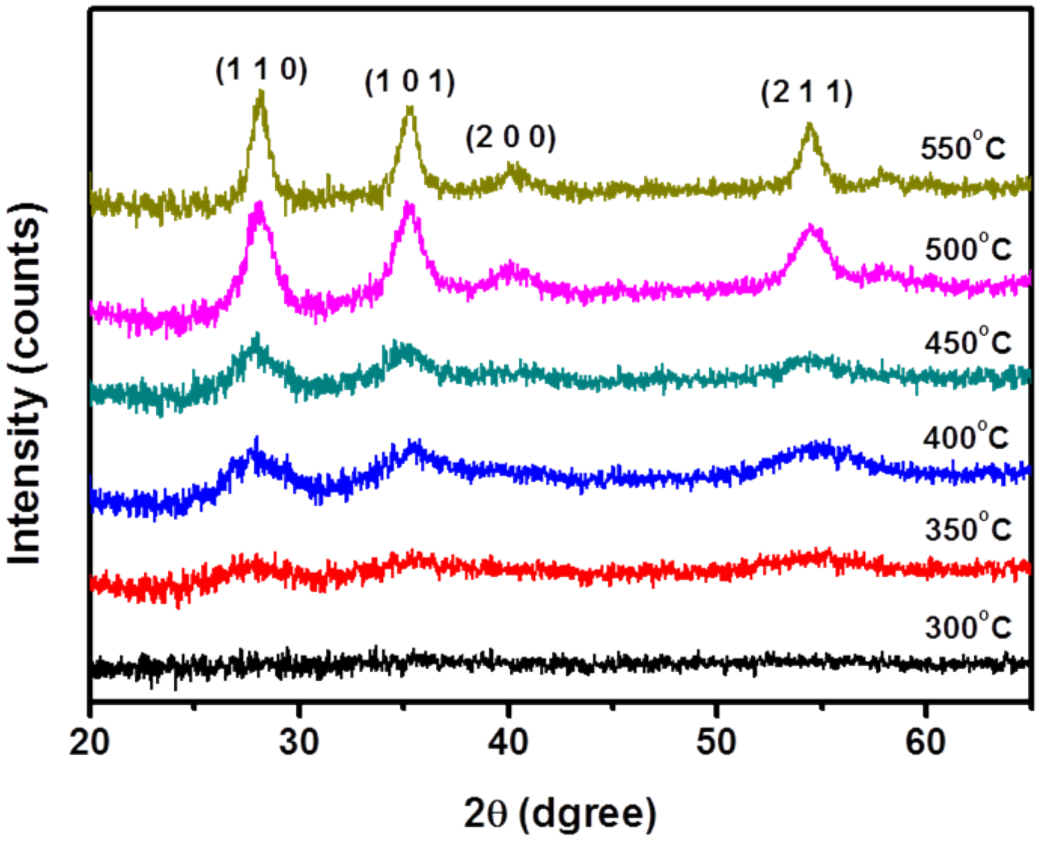

Fig. S2 XRD patterns of the RuO_2-ReO_3 composite nanofibers as a function of annealing temperature in air for electrospun RuO_2-ReO_3 (precursor solution ratio, Ru:Re=2:1) nanofibers at room temperature.

Fig. S3.

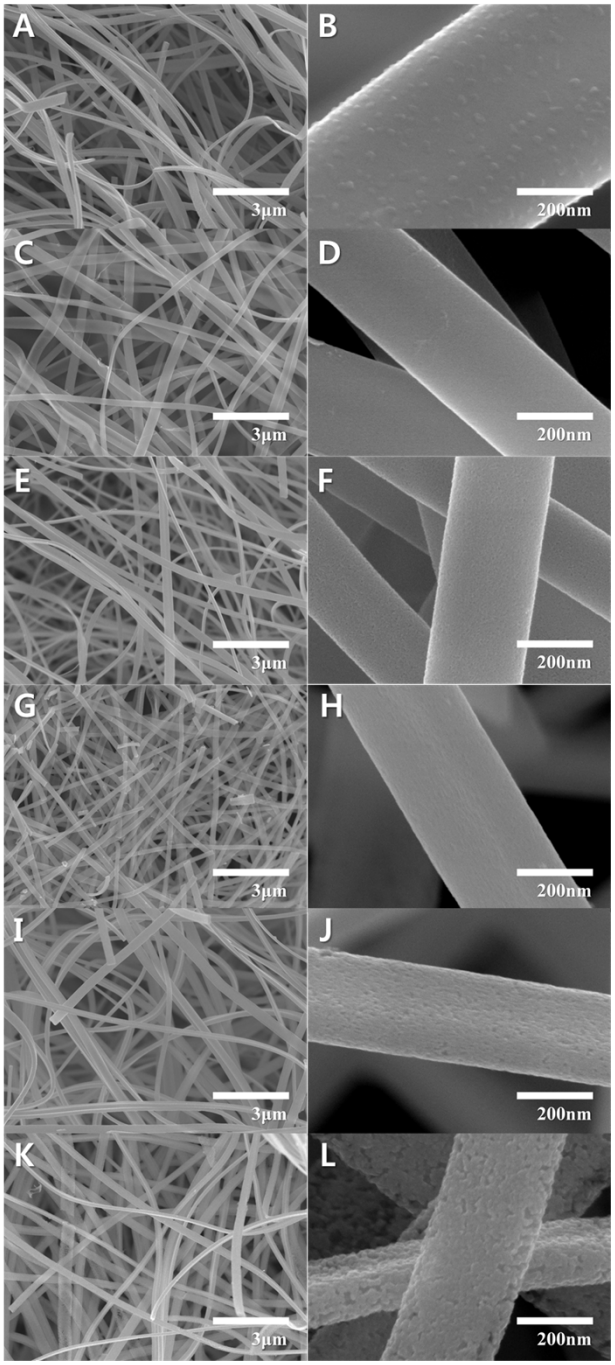

Fig 3S. SEM images of RuO_2-ReO_3(n) composite nanofibers after thermal annealing process: at 300^{o}C (A, B), 350^{o}C (C, D), 400^{o}C (E, F), 450^{o}C (G, H), 500^{o}C (I, J), and 550^{o}C (K, L).

Fig. S4.

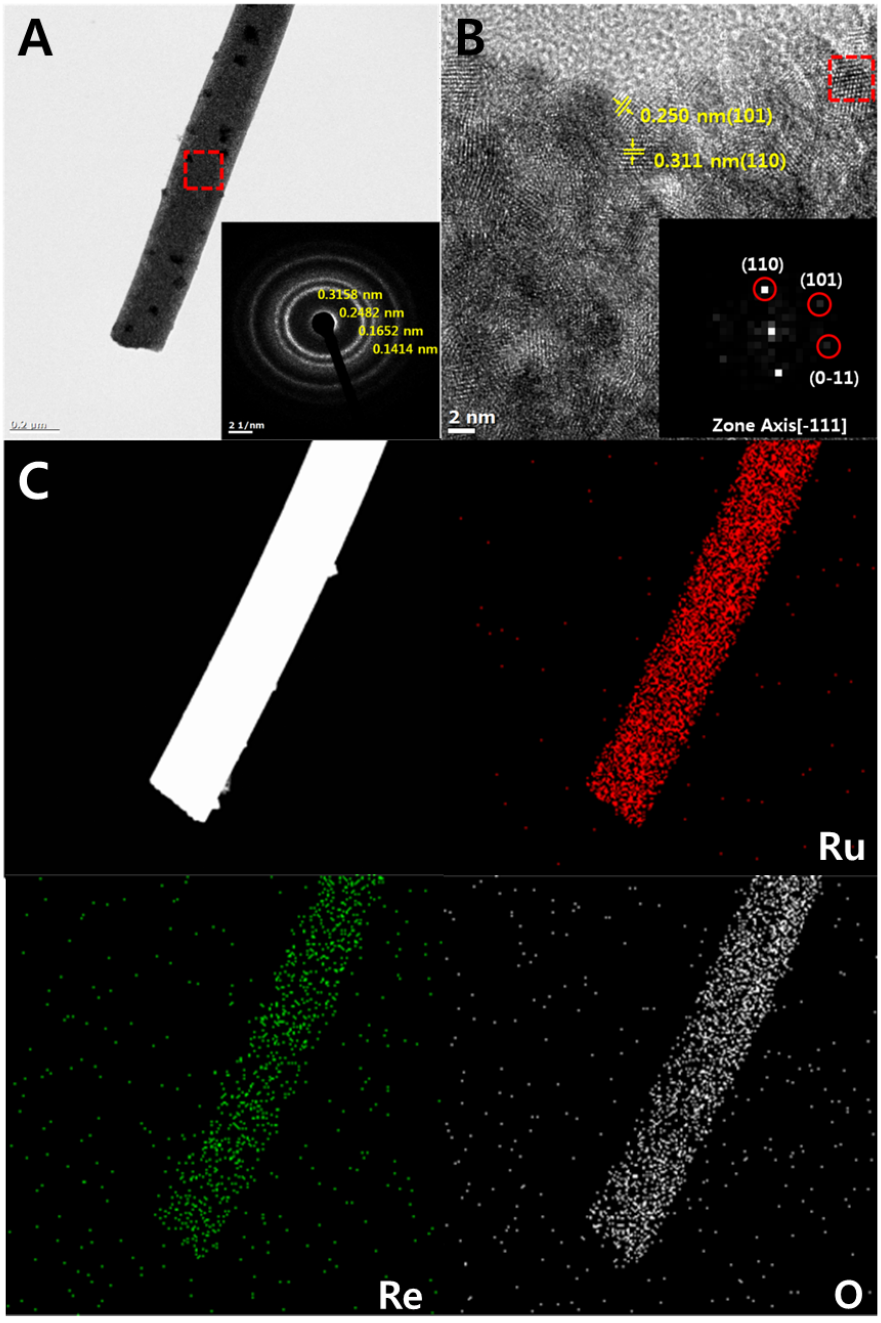

Fig. S4. Detailed crystal structures of RuO_2-ReO_3composite nanofibers by TEM; HRTEM image of RuO_2-ReO_3 nanofibers and the fast Fourier transform (FFT) of the lattice-resolved image

indexed as RuO_2 structure for a sample at 400°C annealing temperature.

Fig. S5.

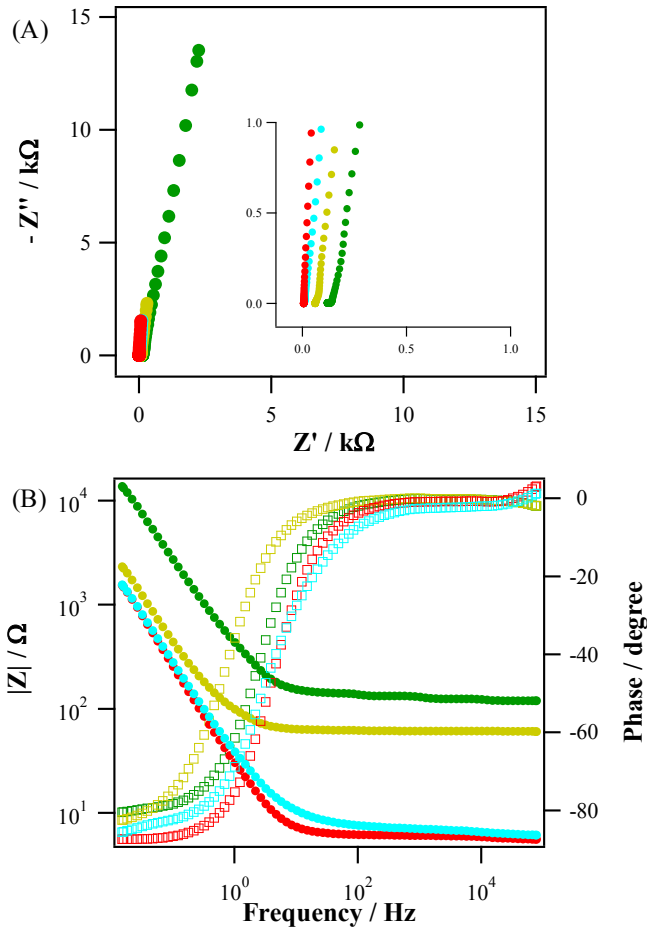

Fig. S5. (A) Nyquist plots and (B) Bode plots of various composite RuO_2-ReO_3(0.00, 0.07, 0.11, and 0.13)/GC electrodes in 1.0 M H_2SO_4 solution (E_{app} = 0.50 V, frequency range: from 10 mHz to 500 kHz); GC (black), RuO_2/GC (green), RuO_2-ReO_3(0.07)/GC (yellow), RuO_2-ReO_3(0.11)/GC (red), and RuO_2-ReO_3(0.13)/GC (cyan).

Fig. S6.

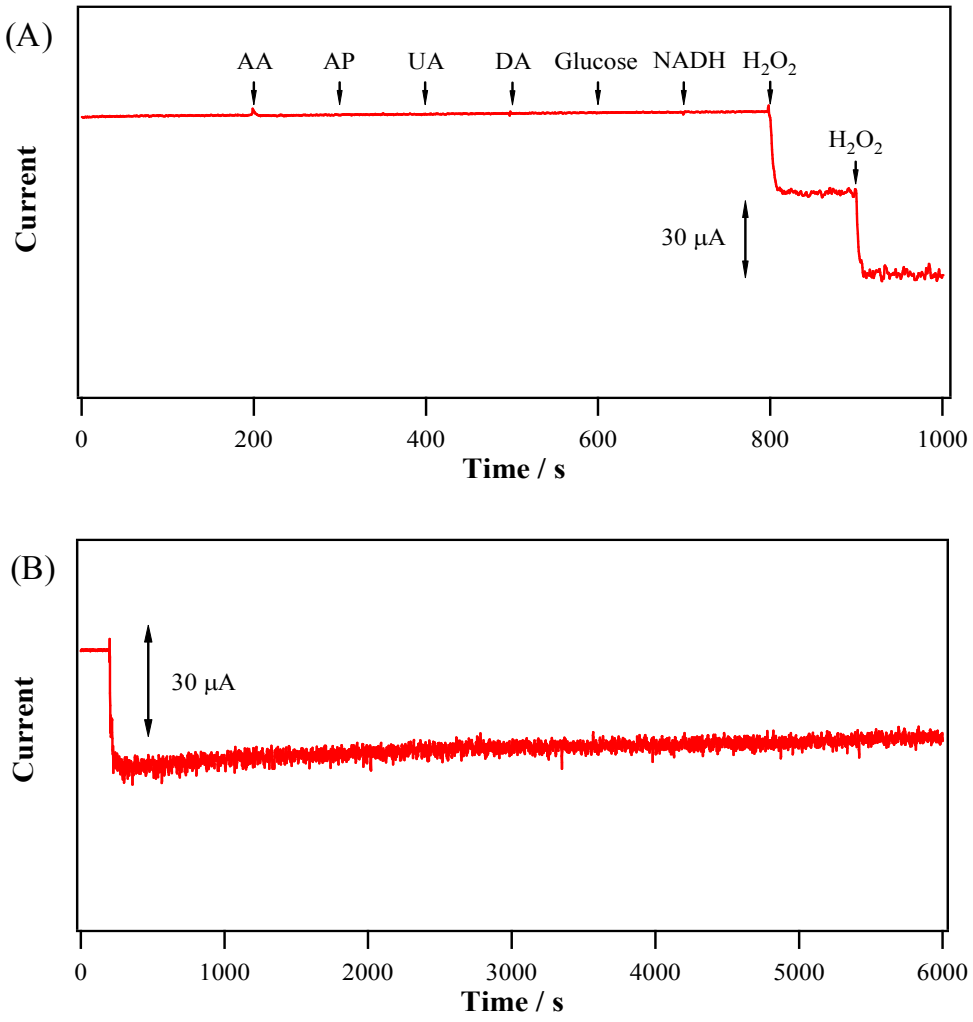

Fig. S6. (A) Dynamic amperometric responses of RuO_2-ReO_3(0.11)/GC to the addition of 0.1 mM ascorbic acid (AA), 0.1 mM acetamidophenol (AP), 0.02 mM uric acid (UA), 0.02 mM dopamine (DA), 5 mM glucose, 0.5 mM NADH, 0.5 mM H_2O_2 and 1.0 mM H_2O_2 (total). (B) Current stability measured at RuO_2-ReO_3(0.11)/GC in 0.10 M PBS (pH = 7.40) containing 0.5 mM H_2O_2 at E_{app} = - 0.2 V vs. SCE.

Fig. S7.

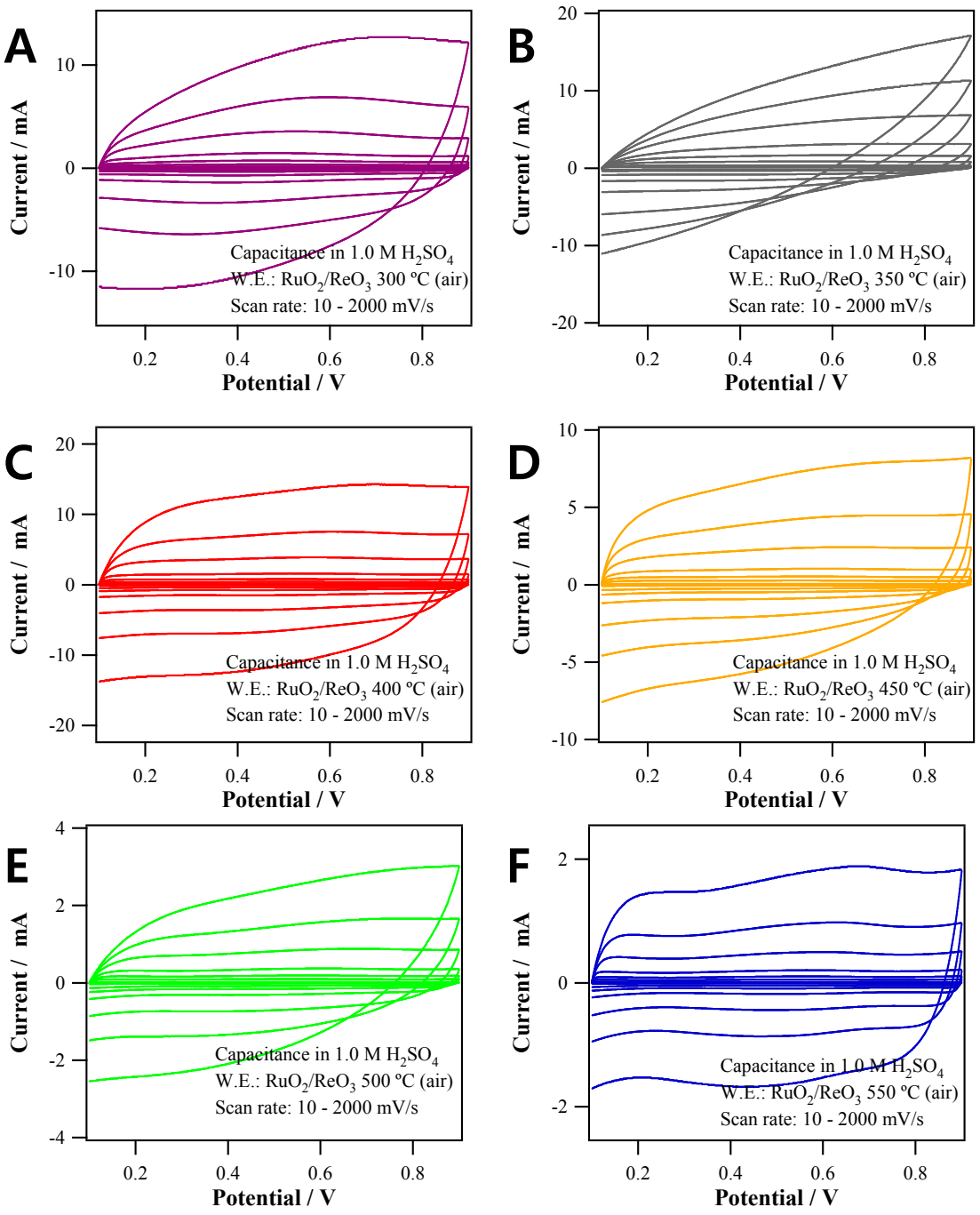

Fig. S7. Capacitance measurements of RuO_2-ReO_3(0.11)/GC in 1.0 M H_2SO_4 solution with v of 100, 500, 1000, and 2000 mV s^{-1} at various annealing temperatures.

Fig. S8.

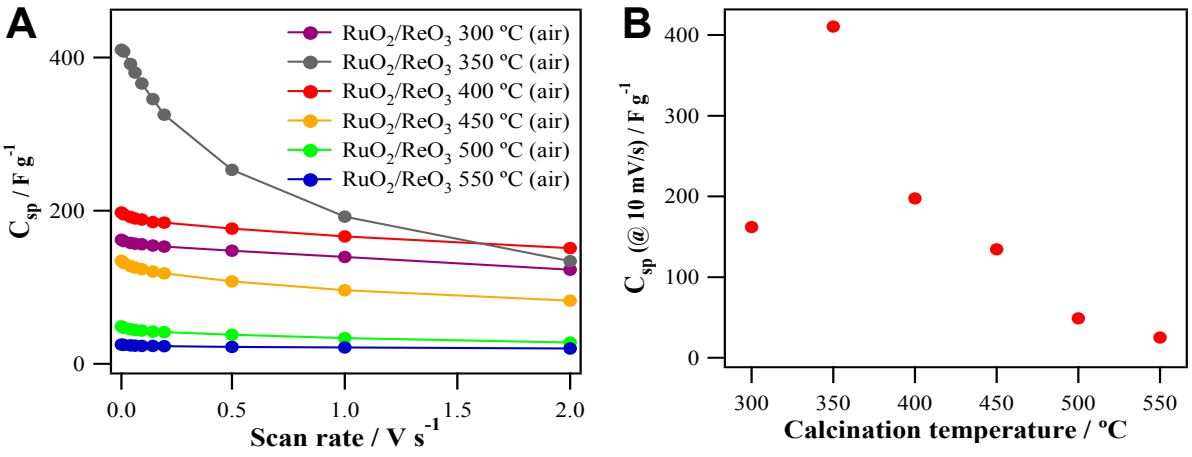

Fig. S8. (A) Variation of specific capacitance of RuO_2-ReO_3(n)/GC electrodes obtained by applying a potential from 0.1 to 0.9 V (vs. SCE) in 1.0 M H_2SO_4 solution with *v* from 10 to 2000 mV s^{-1} at various annealing temperatures. (B) The specific capacitance of RuO_2-ReO_3(n)/GC electrodes with 10 mV s^{-1} at various annealing temperatures.

Fig. S9.

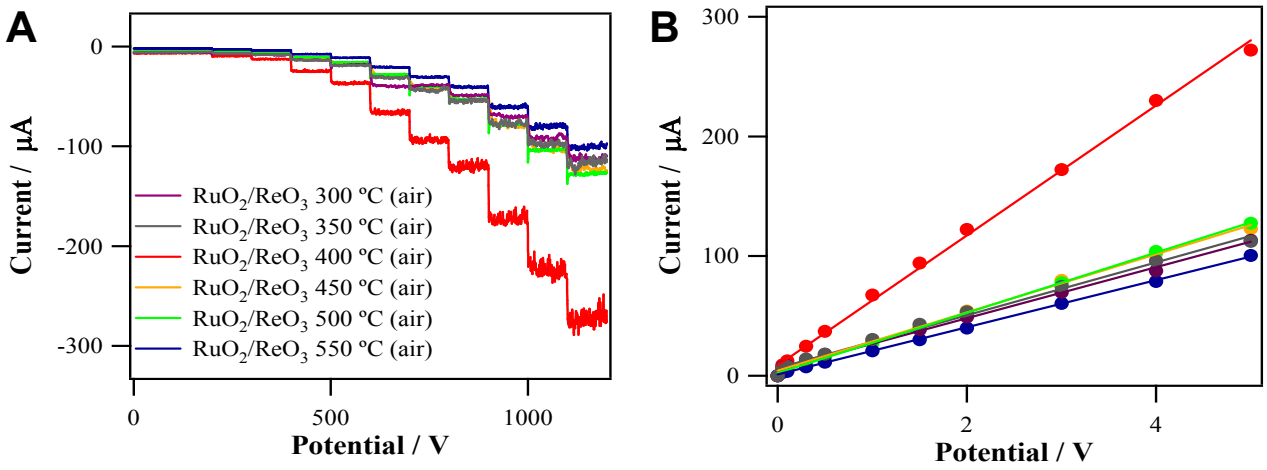

Fig. S9. (A) Dynamic current responses of various electrodes to the addition of H_2O_2 in 0.10 M PBS at E_{app} = - 0.2 V vs. SCE. (B) Corresponding calibration plots of (A) at various annealing temperatures.; at 300^{o}C (purple), 350^{o}C (black), 400^{o}C (Red), 450^{o}C (yellow), 500^{o}C (green), and 550^{o}C (blue).

Table S1

Annealing Temperature	C_{sp} (F g^{-1}) at 10 mV s^{-1}	Capacity loss[a] (%)	τ_c [b] (s)	H_2O_2 Reduction sensitivity[c] (μA $mM^{-1}cm^{-2}$)	H_2O_2 Detection limit (μM)
300°C	161.9	24.1	0.27	301.5	18.4
350°C	410.3	67.3	1.82	312.9	11.5
400°C	197.6	23.5	0.22	769.2	7.6
450°C	134.5	38.6	0.10	344.1	7.1
500°C	48.8	42.6	0.47	356.6	5.5
550°C	25.1	20.2	0.14	278.8	5.5