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Electronic Supplementary Information (ESI)

Mapping the electrocatalytic water splitting activity of VO_2 across its insulator-to-metal phase transition

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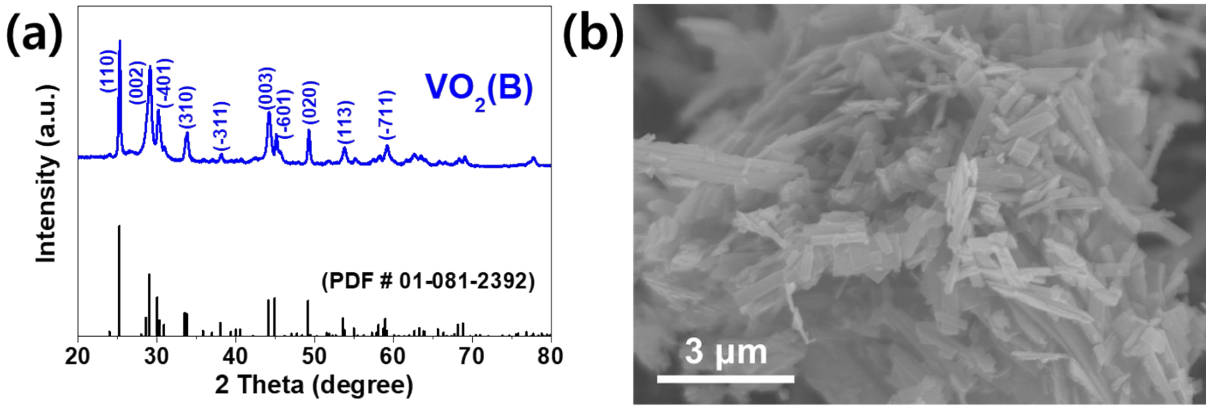

Fig. S1. (a) XRD pattern and (b) SEM image of the as-synthesized VO_2(B) nanobelts.

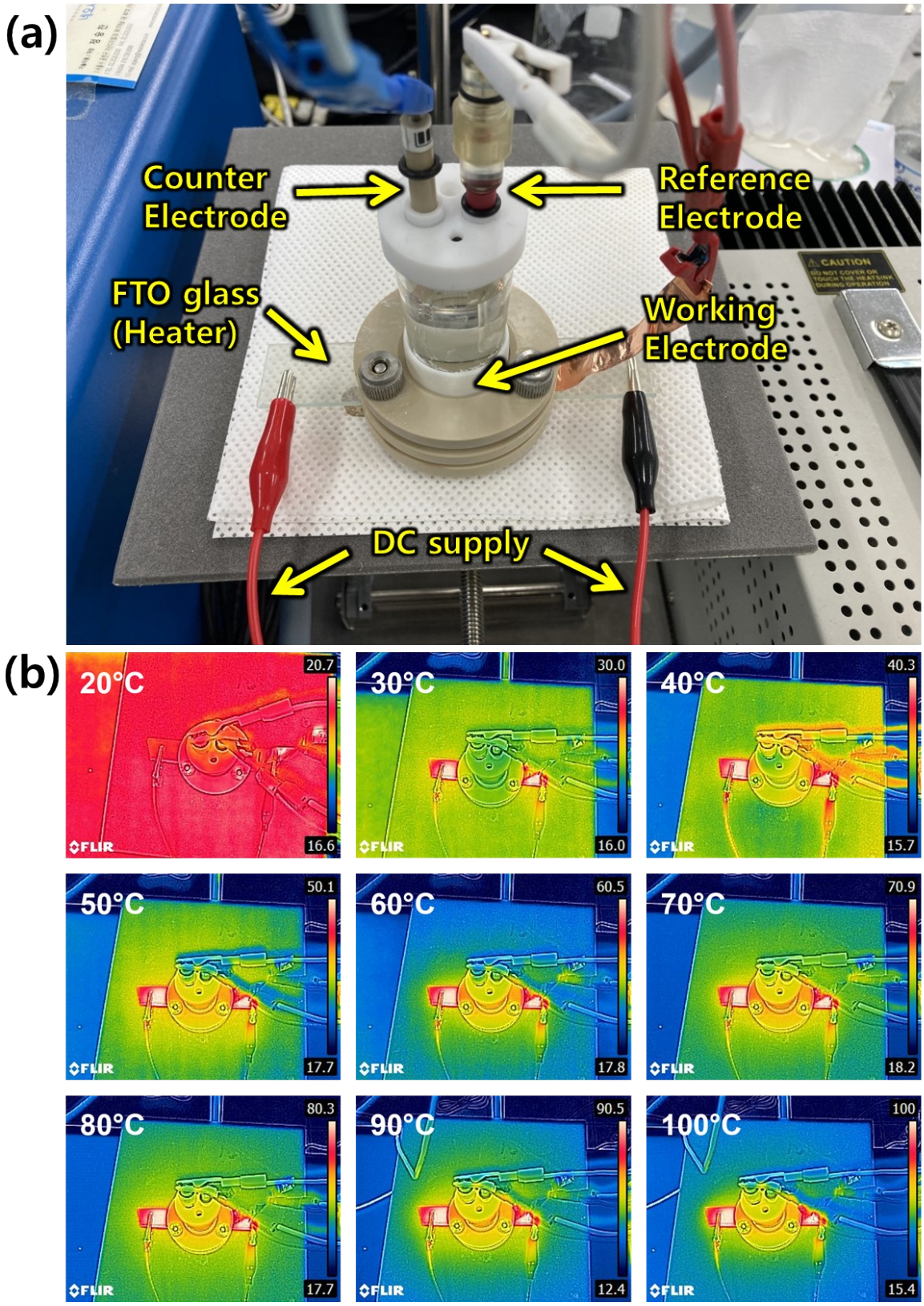

Fig. S2. (a) Homemade electrode heating system and (b) temperature maps acquired using an infrared thermal imaging camera for the heated electrode at each temperature.

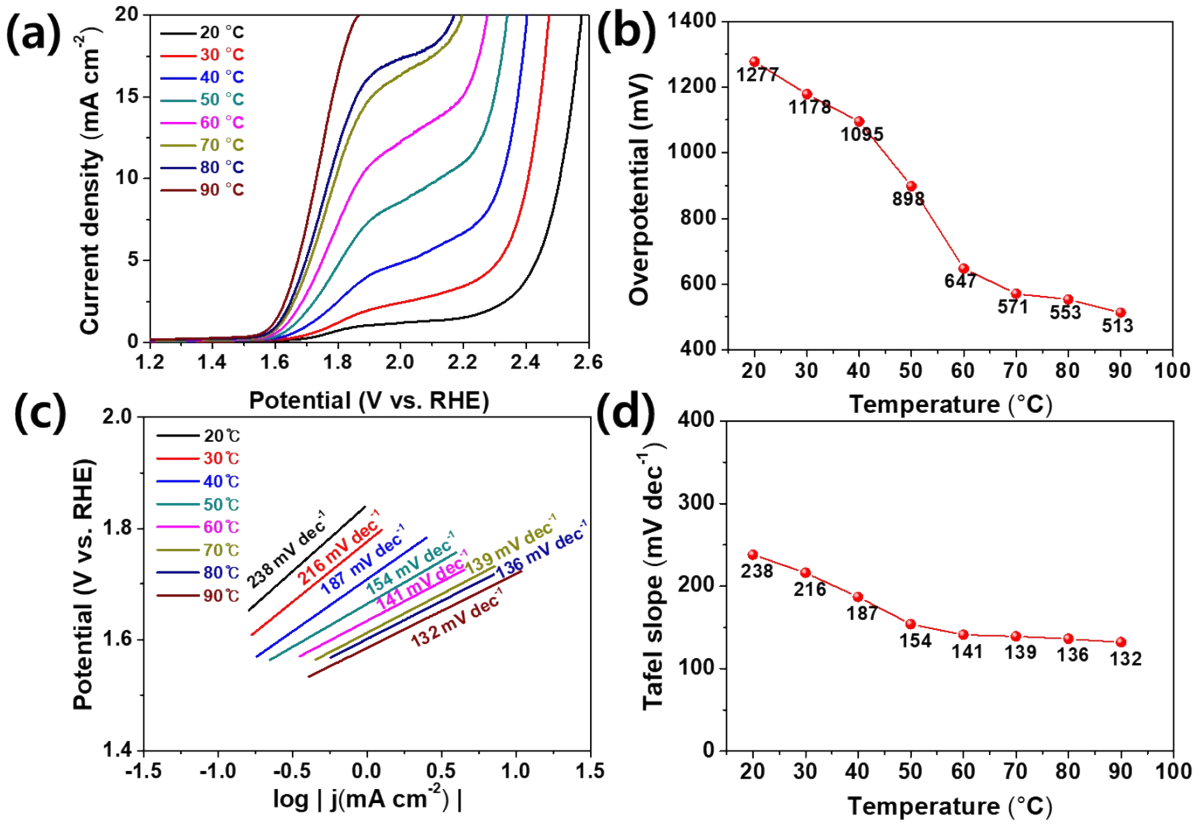

Fig. S3. (a) LSV curves, (c) Tafel plots, and corresponding (b) overpotentials and (d) Tafel slopes plotted as a function of electrode temperature, acquired for the VO_2(B) electrode in 1 M KOH aqueous solution.

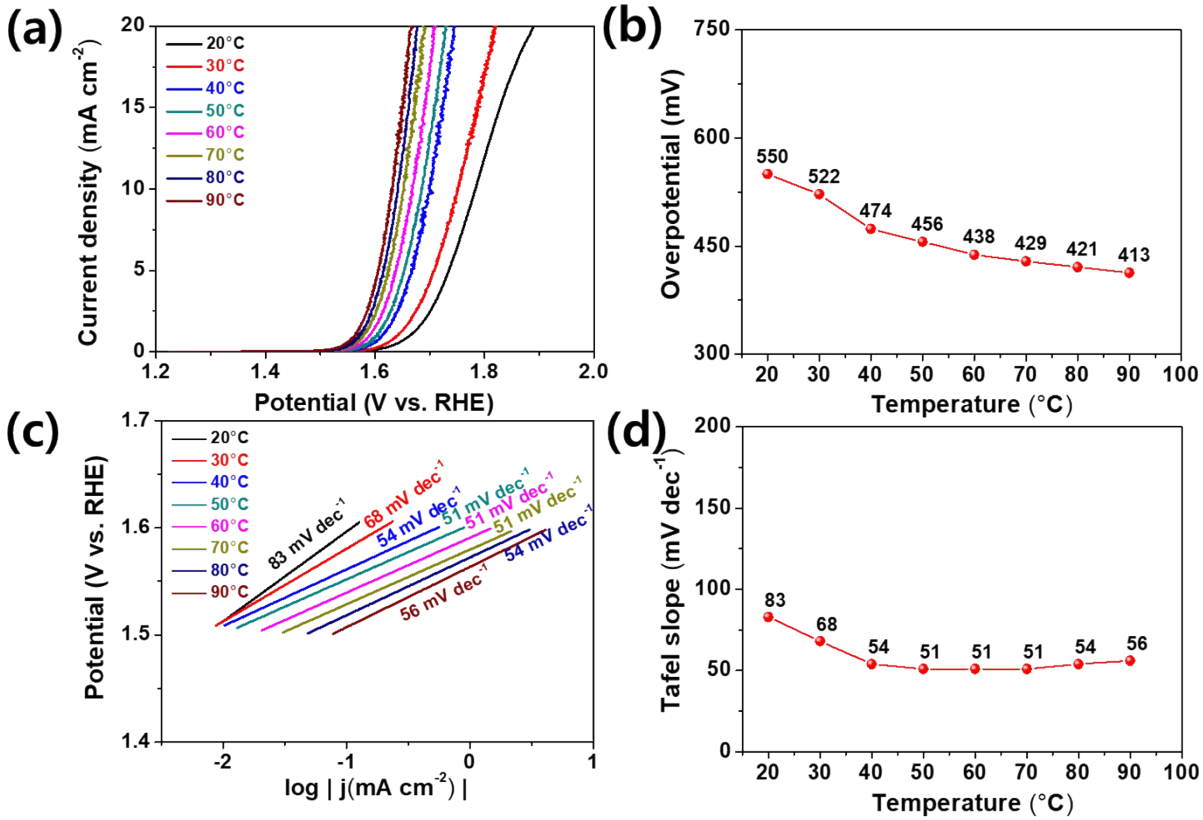

Fig. S4. (a) LSV curves, (c) Tafel plots, and corresponding (b) overpotentials and (d) Tafel slopes plotted as a function of electrode temperature, acquired for the Co_3O_4 electrode in 1 M KOH aqueous solution.

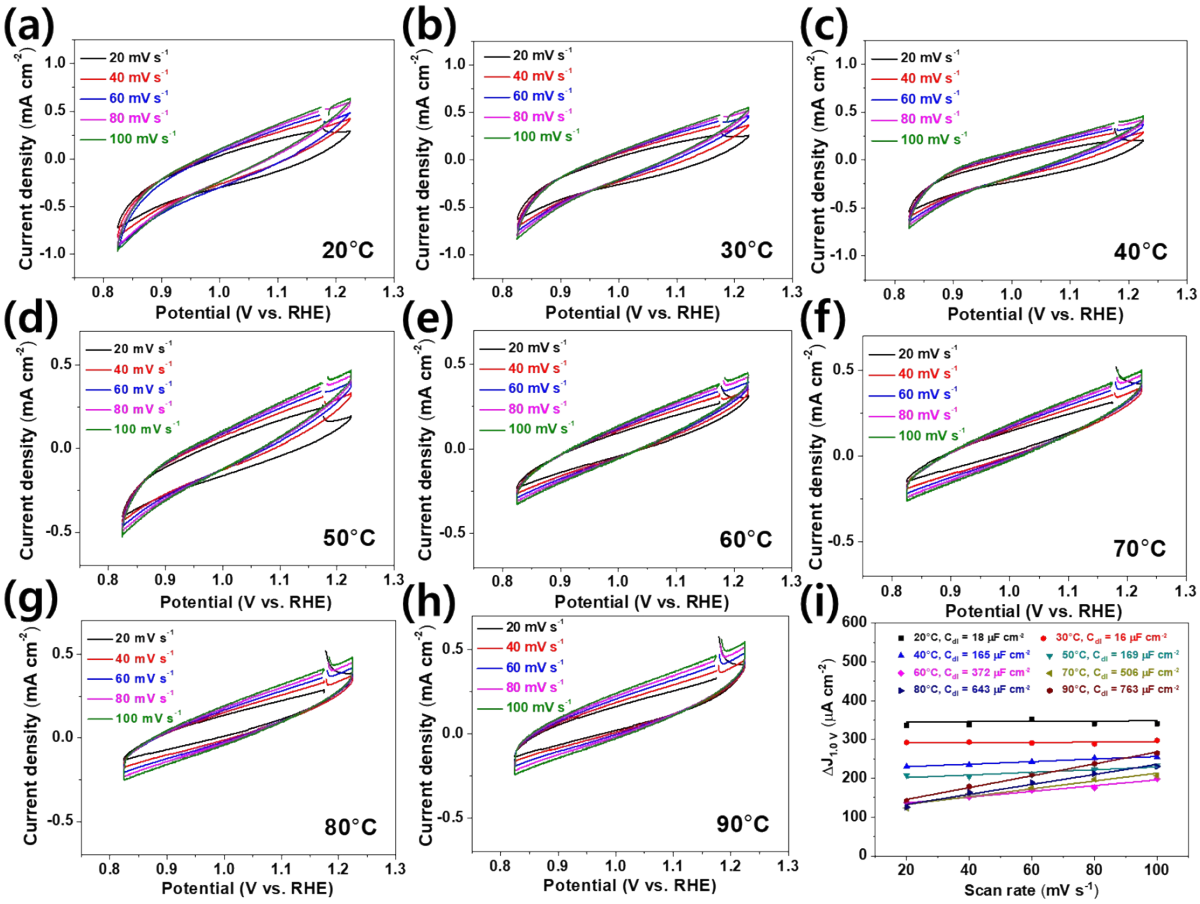

Fig. S5. Cyclic voltammograms of the VO_2(M1) electrode acquired at scan rates of 20-100 mV s^{-1} in the potential range of 0.825-1.224 V vs. RHE in 1 M KOH at each temperature of (a) 20, (b) 30, (c) 40, (d) 50, (e) 60, (f) 70, (g) 80, and (h) 90 °C, respectively, and (i) the corresponding differences (△J) of anodic and cathodic current densities at 1.0 V vs. RHE (in the non-Faradaic region) plotted as a function of the scan rate. Each plot is fitted in a straight line to determine the C_{dl} values.

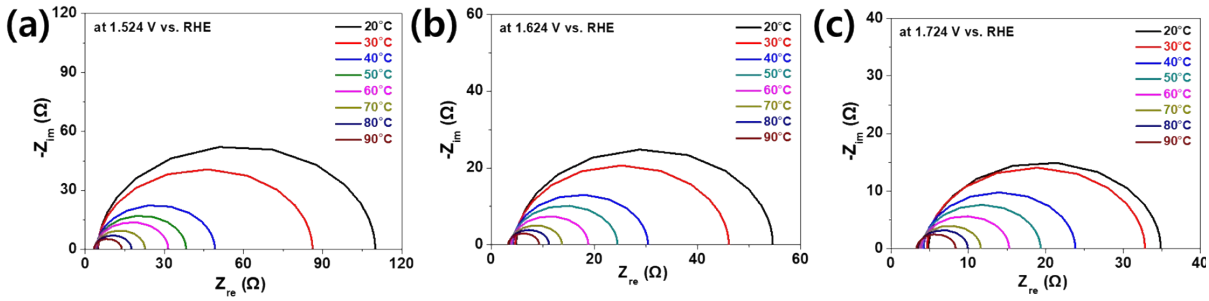

Fig. S6. Nyquist plots of the VO_2(M1) electrode in 1 M KOH electrolyte measured at (a) 1.524 V, (b) 1.624 V, and (c) 1.724 V vs. RHE in the temperature range of 20-90 ^{o}C.

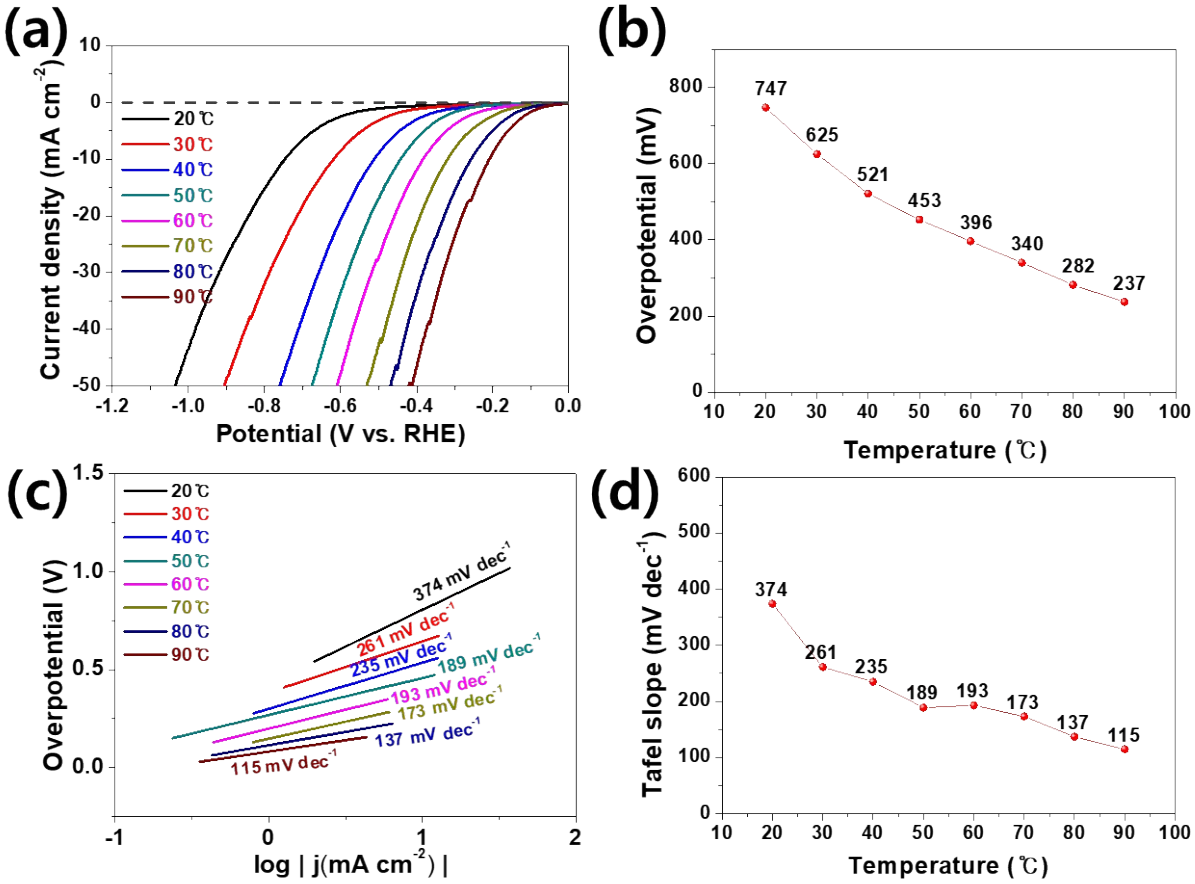

Fig. S7. (a) LSV curves, (c) Tafel plots, and corresponding (b) overpotentials and (d) Tafel slopes plotted as a function of electrode temperature, acquired for the VO_2(B) electrode in 0.5 M H_2SO_4 aqueous solution.

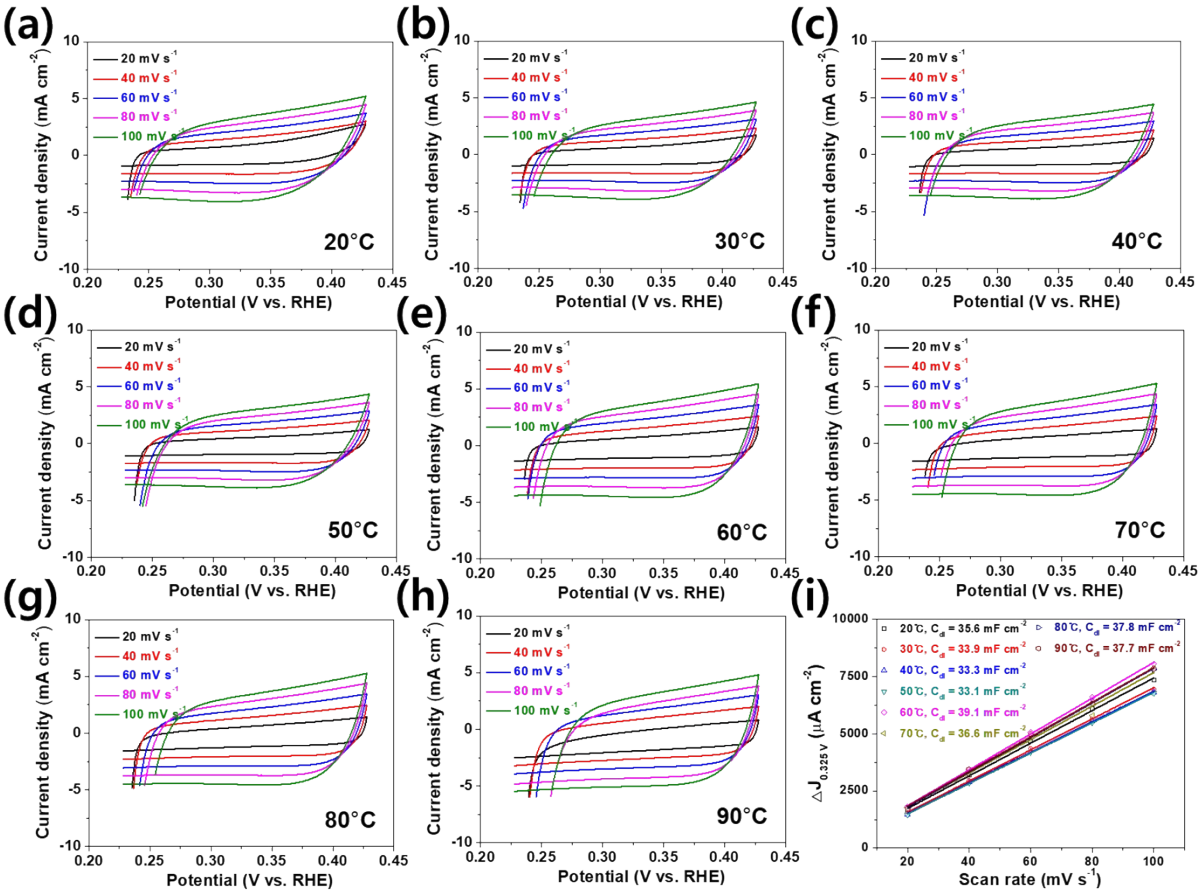

Fig. S8. Cyclic voltammograms of the VO_2(M1) electrode acquired at scan rates of 20-100 mV s^{-1} in the potential range of 0.228-0.428 V vs. RHE in 0.5 M H_2SO_4 at each temperature of (a) 20, (b) 30, (c) 40, (d) 50, (e) 60, (f) 70, (g) 80, and (h) 90 °C, respectively, and (i) the corresponding differences (△J) of anodic and cathodic current densities at 0.325 V vs. RHE (in the non-Faradaic region) plotted as a function of the scan rate. Each plot is fitted in a straight line to determine the C_{dl} values.

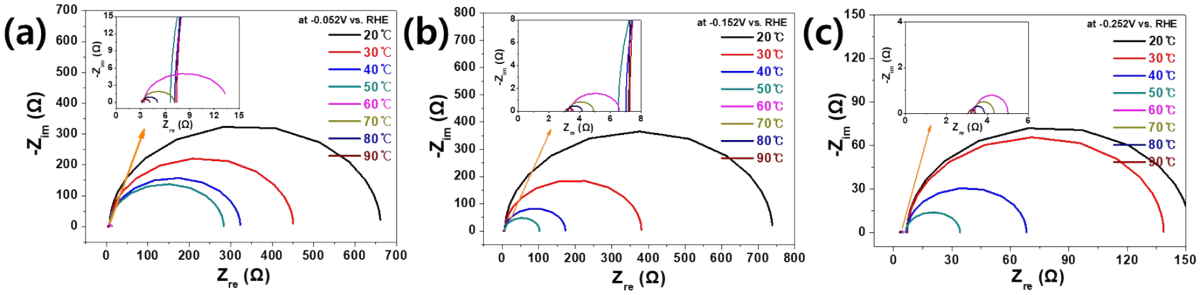

Fig. S9. Nyquist plots of the VO_2(M1) electrode in 0.5 M H_2SO_4 electrolyte measured at (a) -0.052 V, (b) -0.152 V, and (c) -0.252 V vs. RHE in the temperature range of 20-90 ^{o}C.

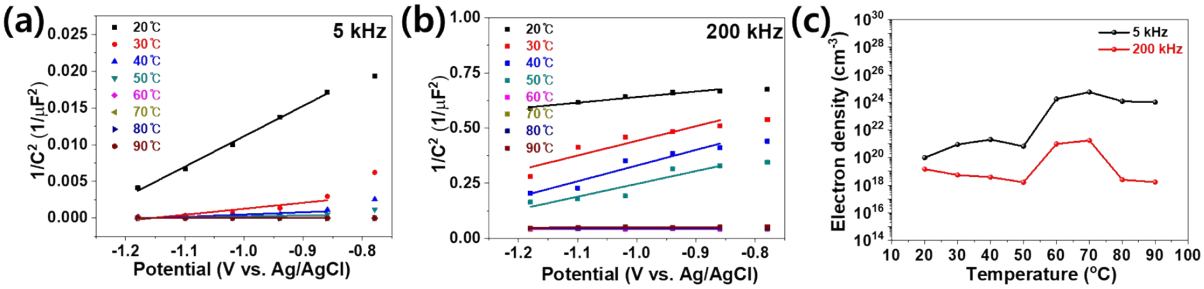

Fig. S10. Mott-Schottky plots of the VO_2(M1) electrode for a frequency of (a) 5 kHz and (b) 200 kHz and (c) the corresponding electron density in the temperature range of 20-90 °C in 0.5 M H_2SO_4, respectively.

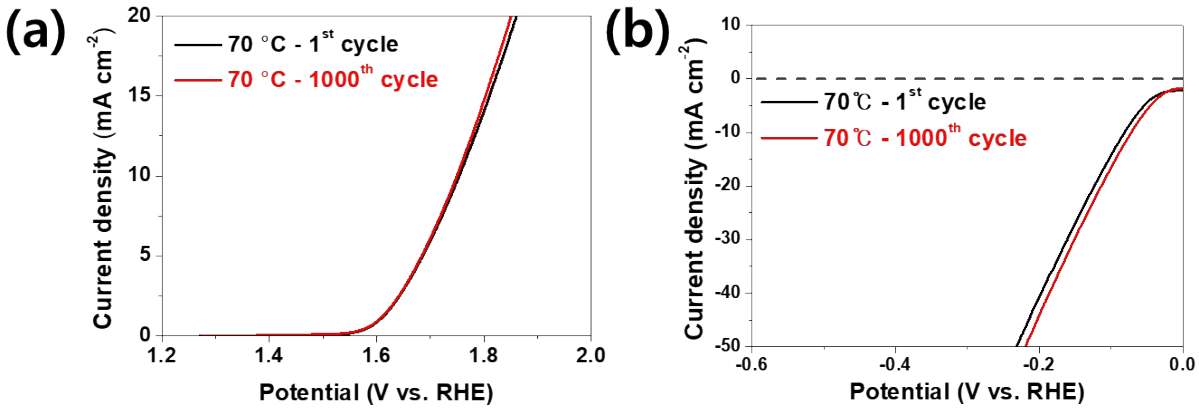

Fig. S11. LSV curves of the VO_2(M1) electrode after 1st and 1000th CV cycles at a scan rate of 100 mV s^{-1} measured in (a) 1 M KOH and (b) 0.5 M H_2SO_4 aqueous solutions, respectively.

Temperature (°C)	Voltage (V)	Current (A)
30	5.6	0.1
40	8.1	0.15
50	10.3	0.19
60	11	0.21
70	13.3	0.26
80	15.3	0.3
90	16.8	0.33

Table S1. The applied DC voltage and current for each electrode temperature.

Electrode temperature (°C)	Electrolyte temperature (°C)
20	22
30	27
40	30
50	33
60	37
70	43
80	48
90	52

Table S2. Measured temperature of 1 M KOH aqueous solution at each electrode temperature.