Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Nickel-titanium Oxide as a Novel Anode Material for Rechargeable Sodium-ion Batteries

Ramchandra S. Kalubarme,* Akbar I. Inamdar, D. S. Bhange, Hyunsik Im, Suresh W. Gosavi, Chan-Jin Park*

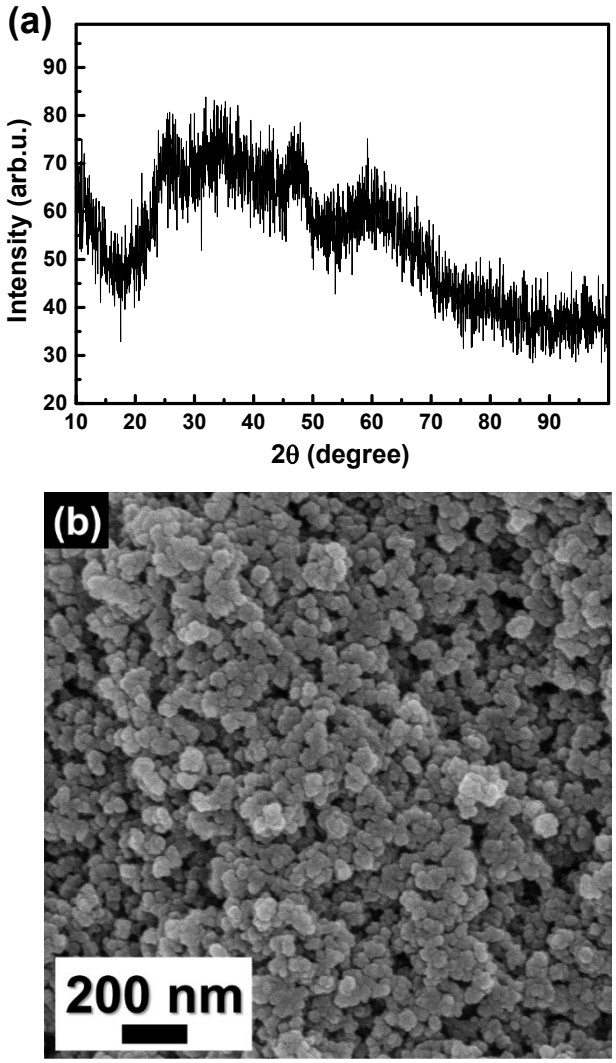

Figure S1. a) XRD pattern and b) FE-SEM image of as-prepared $NiTiO_3$ powder samples that were synthesised through hydrothermal process.

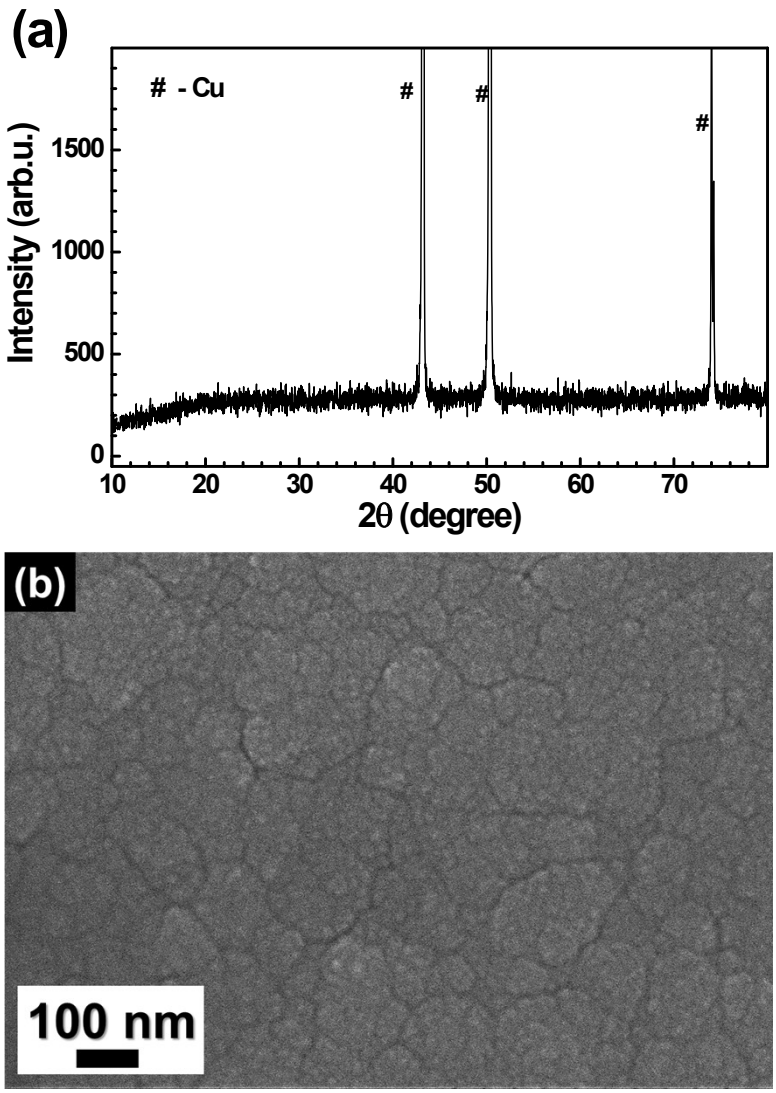

Figure S2. a) XRD pattern and b) FE-SEM image of sputter-deposited NTO thin films on Cu substrate.

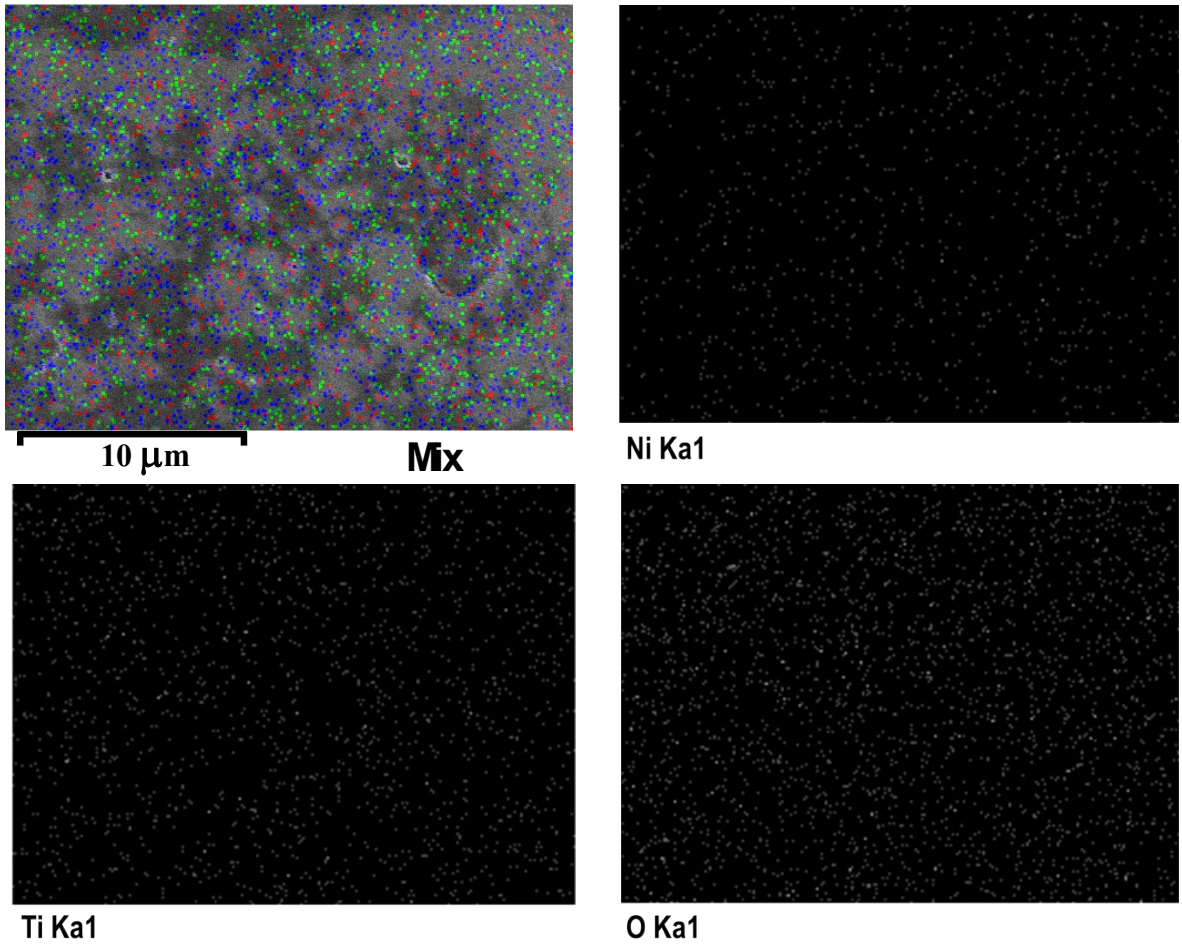

Figure S3. SEM-EDS elemental mapping of sputter-deposited NTO thin film.

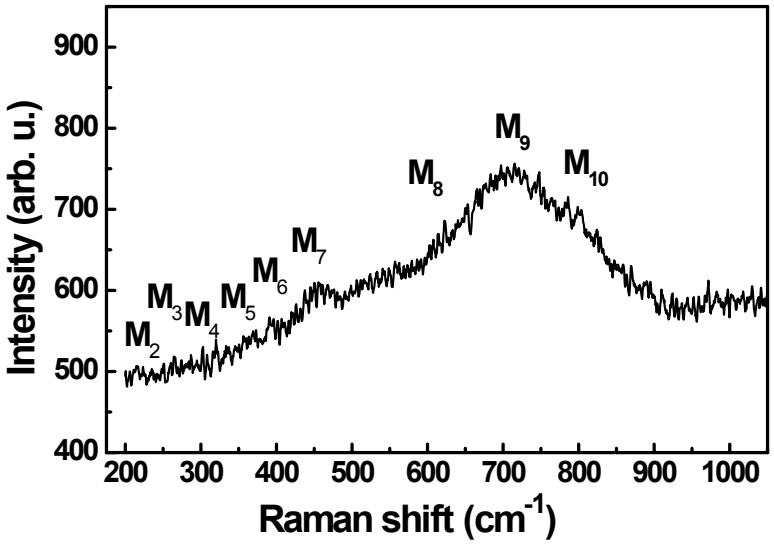

Figure S4. Raman spectra for the NTO thin film, sputter-deposited on Cu sheet.

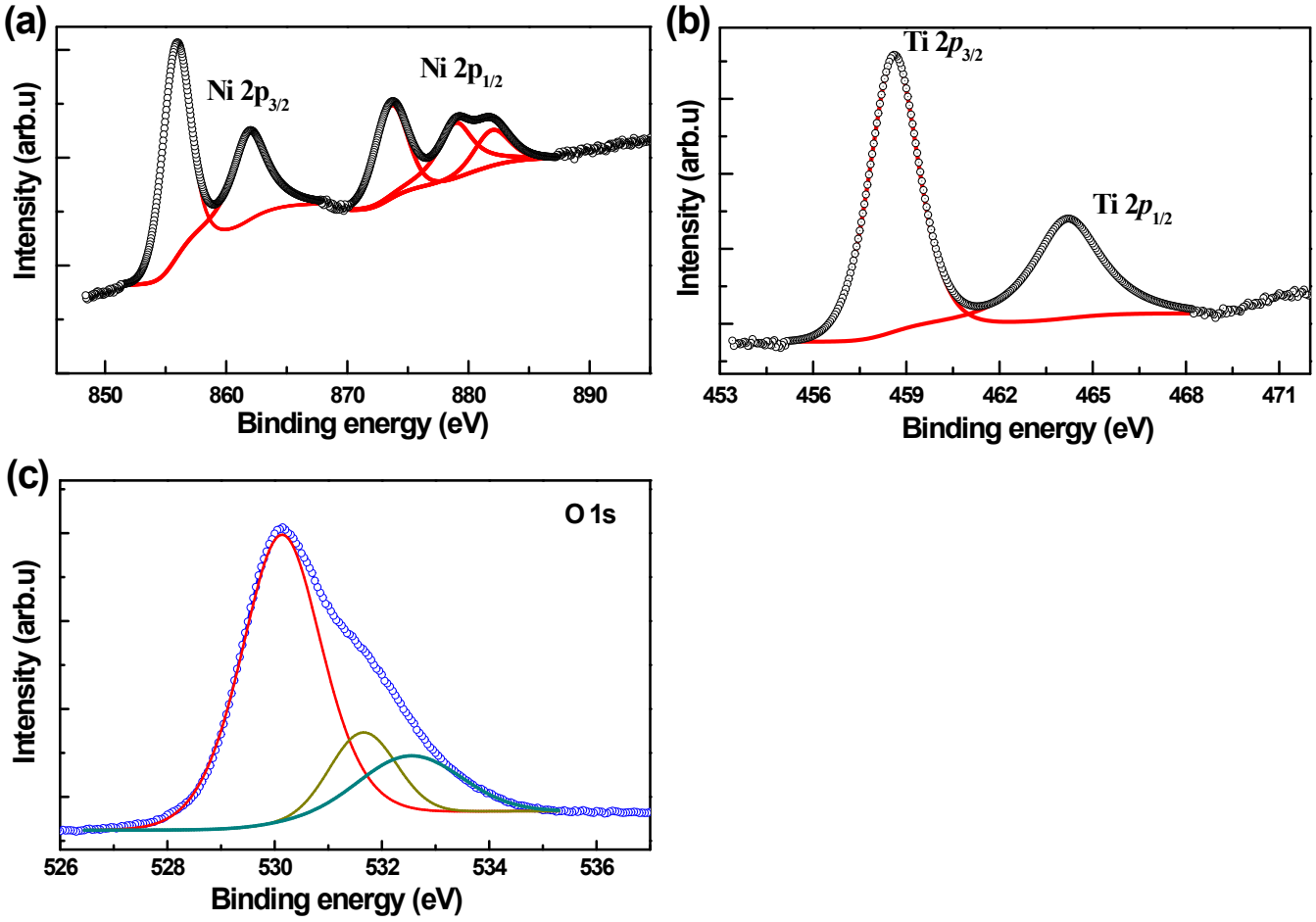

Figure S5. Core-level XPS spectra for: a) Ni 2p, b) Ti 2p, and c) O 1s in NTO thin film, sputter-deposited on Cu sheet.

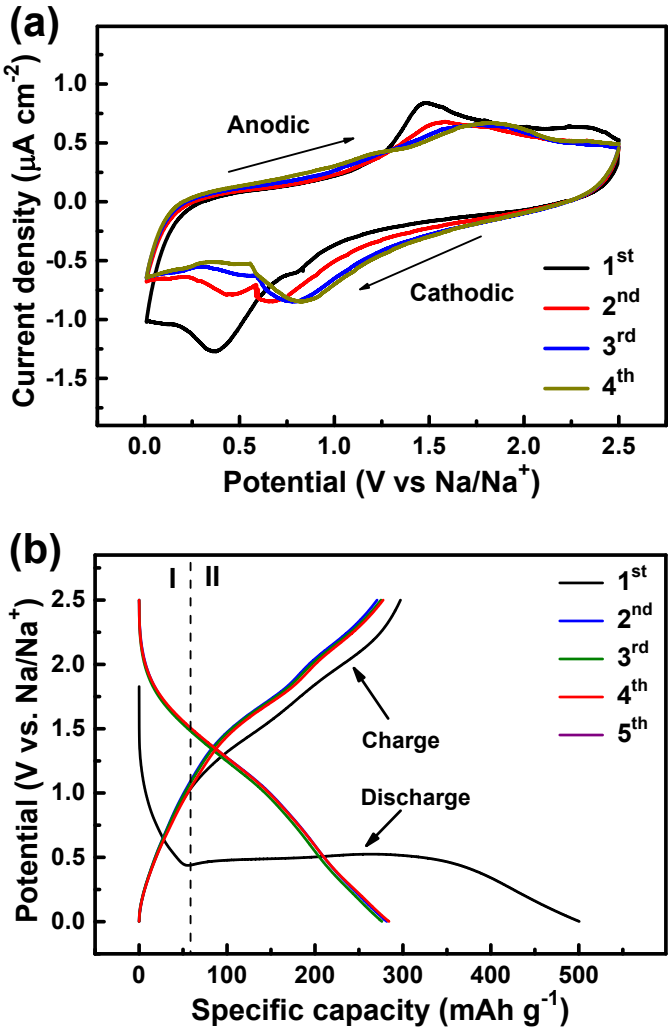

Figure S6. a) Cyclic voltammograms measured at 0.1 mV s^{-1} and b) charge-discharge-potential profiles at the specific current of 50 mA g^{-1} for the sputter-deposited NTO-thin-film electrode.

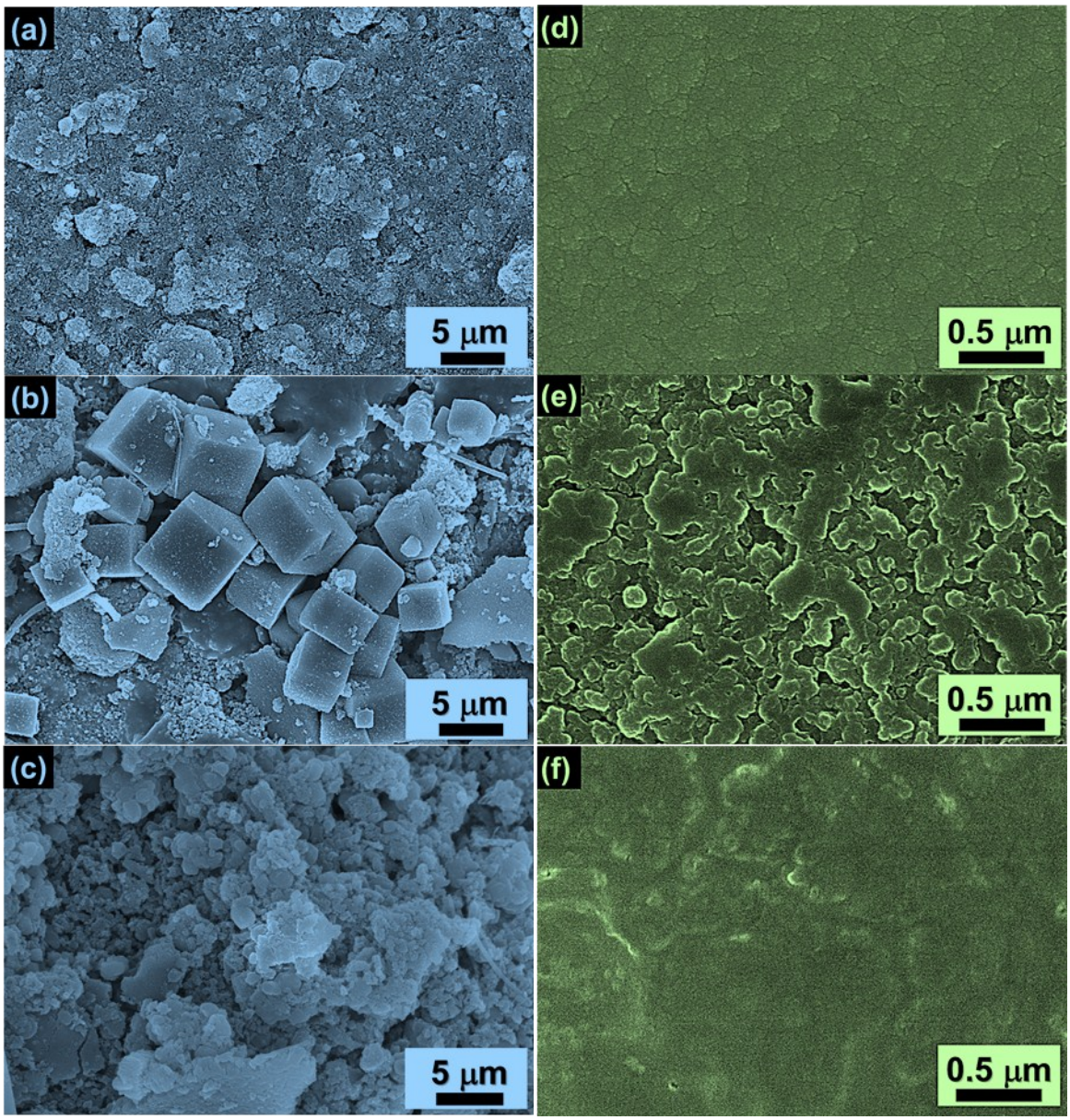

Figure S7. FE-SEM images of the: a-c) NTO-powder and d-f) thin-film electrodes. (a, d) pristine, (b, e) sodiated (after 1st discharge), and (c, f) desodiated (after 1st charge).

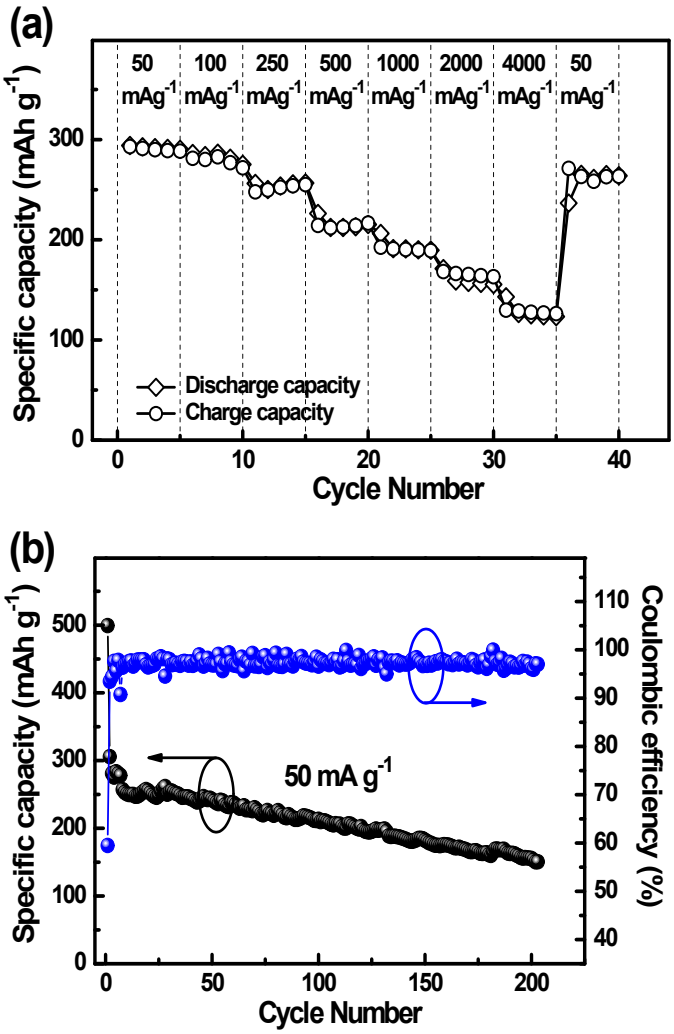

Figure S8. a) Rate capability and b) cyclability of the NTO-thin-film-based electrode.

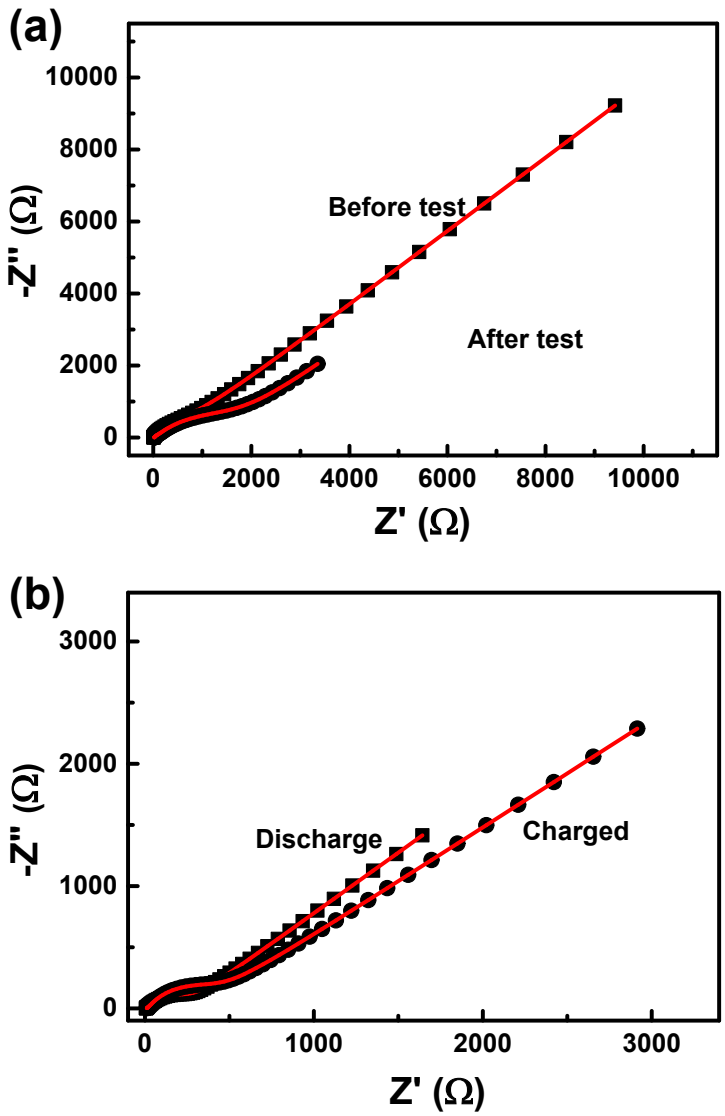

Figure S9. Nyquist-impedance spectra for the NTO-thin-film-based electrode: a) Before and after all discharge-charge tests, and b) after 1st discharge and 1st charge (symbols indicate the measured data, and lines indicate the simulated results).

Table S1. Electrolyte resistance (R_e), film resistance (R_f), and charge-transfer resistance (R_{ct}) calculated from the Nyquist-impedance spectra that were recorded before, after, and during the charge-discharge tests for the NTO-thin-film electrode.

	Before test	1st discharge	1st charge	After 200 cycles
R_e (Ω)	2.28	2.8	9.47	18.44
R_f (Ω)	1030	9.48	29.13	49.5
R_{ct} (kΩ)	165.7	0.342	0.465	1.407
Q_1 (μF)	1.87	1.25	3.21	5.93
Q_2 (μF)	0.313	0.111	0.101	0.727