Supporting Information

Effects of Phase Change and Cu Doping on the Li Storage Properties of Rutile TiO_2

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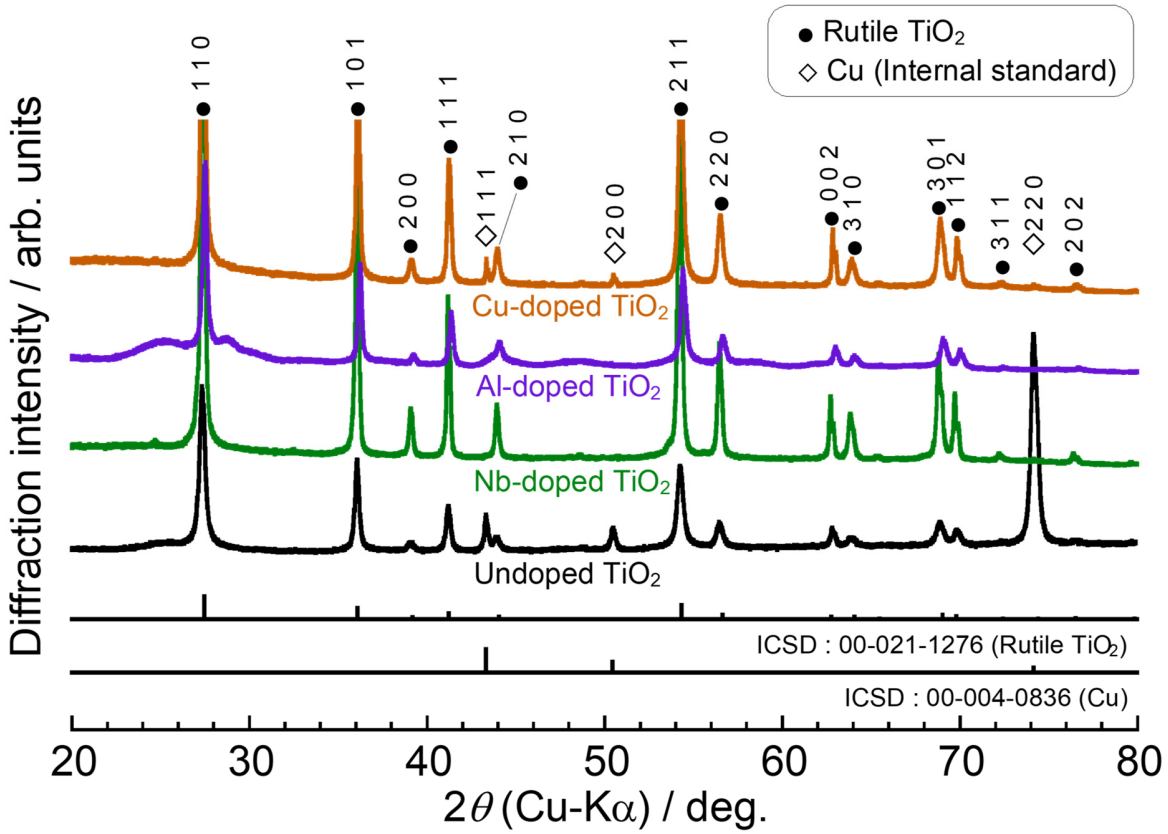

Fig. S1. XRD patterns of various impurity-doped TiO_2 particles prepared by the hydrothermal method.

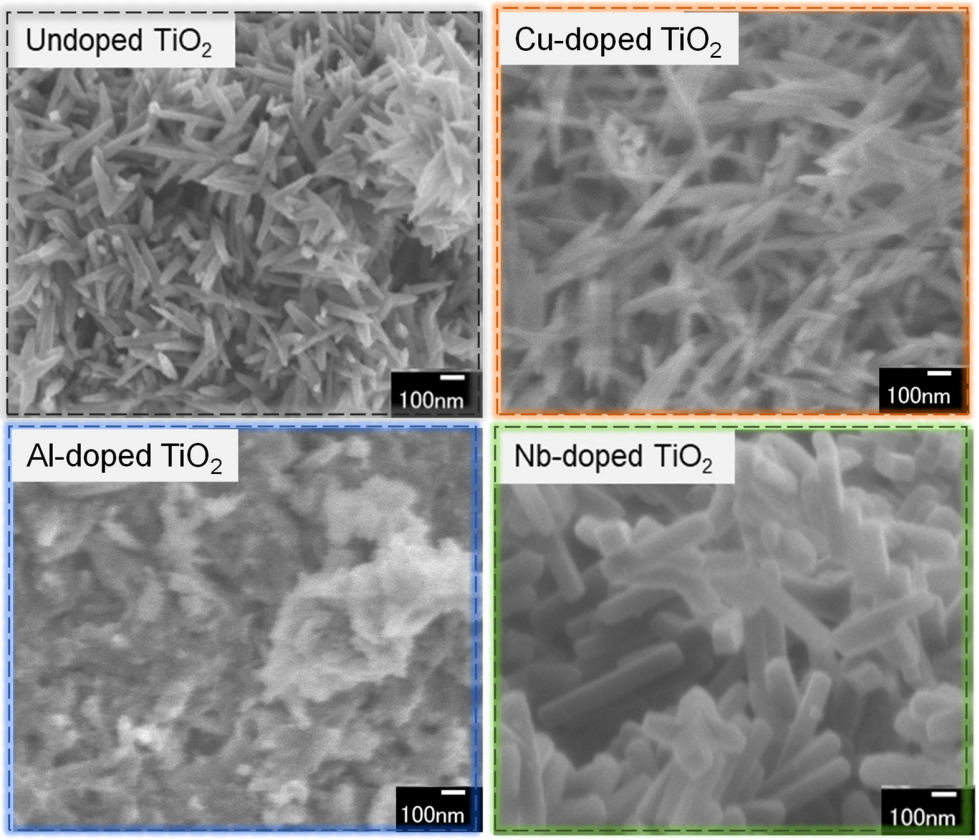

Fig. S2. FE–SEM images of various impurity-doped TiO_2 particles prepared by the hydrothermal method.

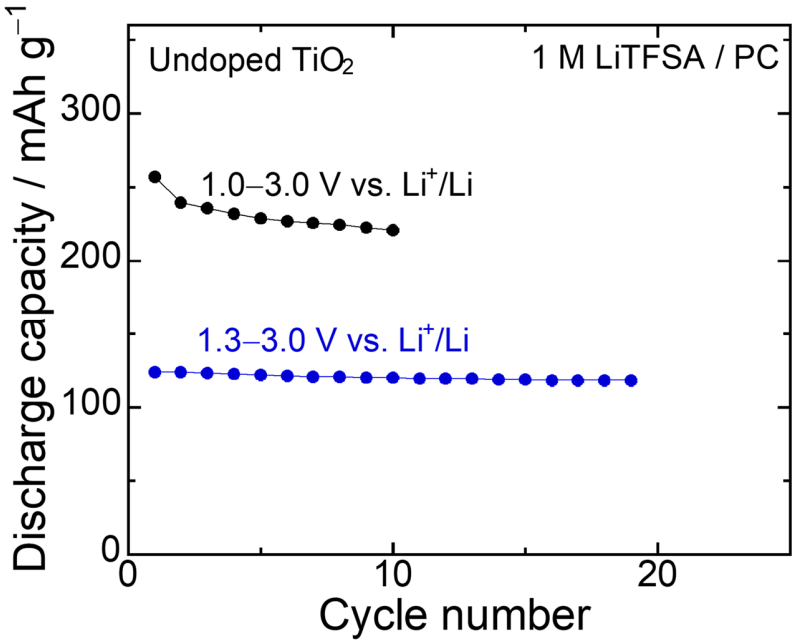

Fig. S3. Cyclability of the undoped TiO_2 electrode in the potential ranges of 1.0−3.0 and 1.3−3.0 V vs. Li^+/Li.

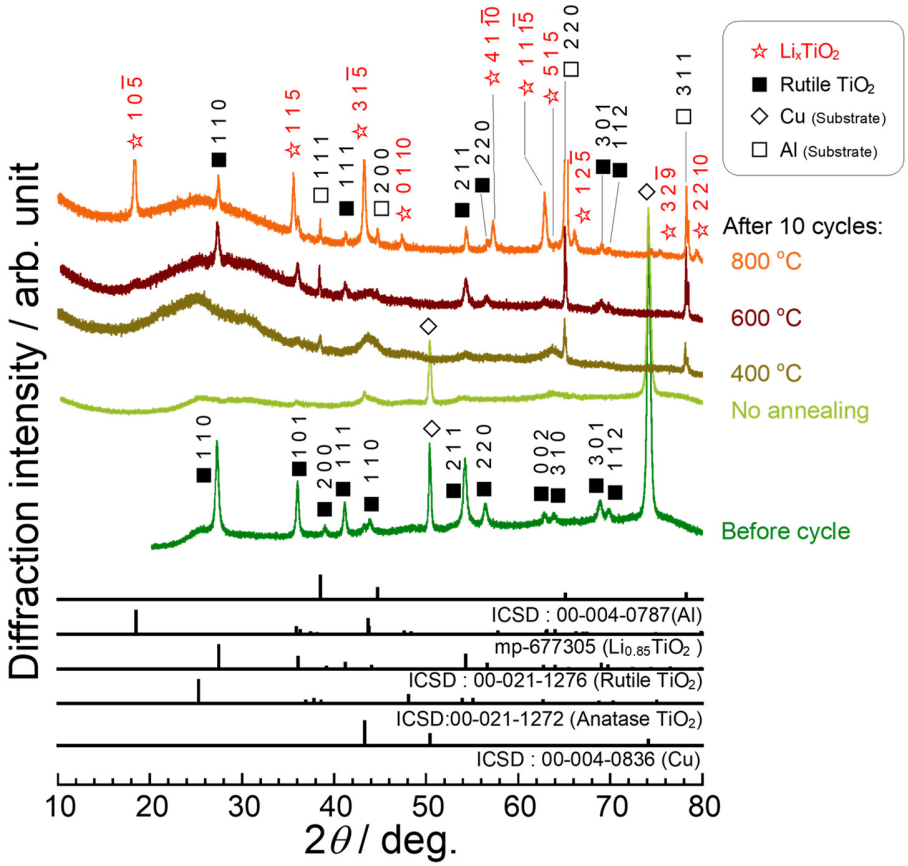

Fig. S4. XRD patterns of the undoped TiO_2 electrodes recorded before charge−discharge cycling and after the delithiation at the 10th cycle conducted at 0.1*C*. Annealing was carried out at 400, 600, and 800 ºC in vacuum for 20 minutes. Before the annealing, no remarkable XRD peak was found. As shown by TEM observation result (Fig. 3), nanocrystalline particles were formed by repeating charge and discharge. Due to the low crystallinity, we could not detect XRD peak for the delithiated TiO_2. After the annealing at 600 ºC, XRD peaks of disordered layered Li_xTiO_2 appeared 18.4º and 44º. The peaks of rutile TiO_2 also appeared. It is suggested that rutile TiO_2 particles partially underwent pulverization to reduce crystallinity in the first lithiation process, and that the crystallinity was recovered by the post-annealing. After the annealing at 800 ºC, we could clearly confirm many XRD peaks of the disordered layered Li_xTiO_2.

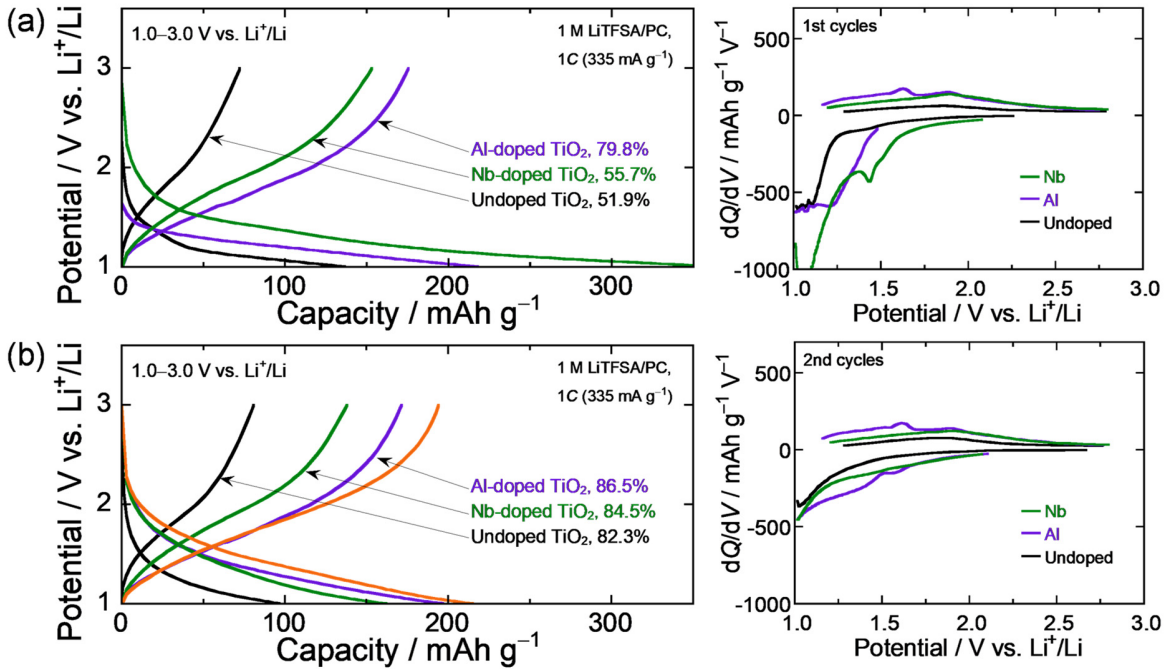

Fig. S5. Charge−discharge curves and differential capacity plots (dQ/dV) of various impurity-doped TiO_2 electrodes obtained during the (a) first and (b) second cycles. The Coulombic efficiencies are listed in the figures.

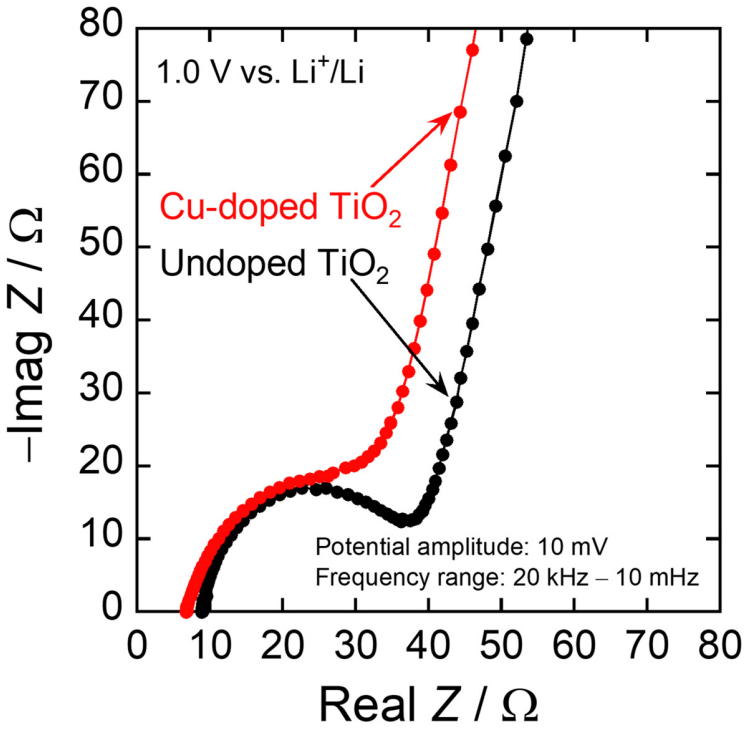

Fig. S6. Nyquist plots of the Cu-doped TiO_2 electrode and undoped TiO_2 electrode obtained in the charged (lithiated) state of the third cycle. A semicircle of the Cu-doped TiO_2 electrode is comparable to that of the undoped TiO_2 electrode, indicating that the electrical conductivity of the undoped TiO_2 electrode was increased by the same amount as that of the Cu-doped TiO_2 electrode in the Li-inserted state.