

Supplementary

The Role of Cerium Valence on the Conversion Temperature of $\text{H}_2\text{Ti}_3\text{O}_7$ Nanoribbons to $\text{TiO}_2\text{-B}$ and Anatase Nanoribbons, and Further to Rutile

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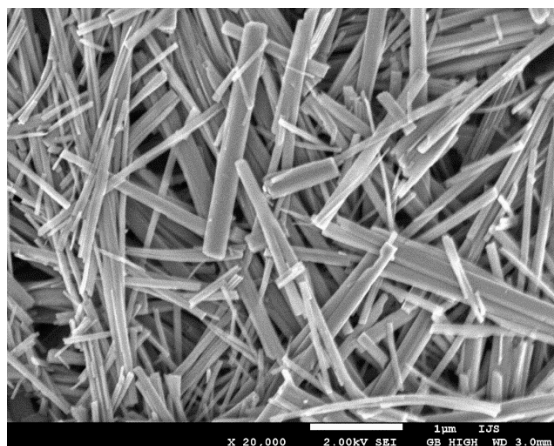


Figure S1. SEM image of $\text{H}_2\text{Ti}_3\text{O}_7$ nanoribbons (HTiNRs) used as a precursor for wet impregnation/intercalation with Ce^{4+} and Ce^{3+} . The width of the nanoribbons (NRs) ranges from 20 to 350 nm, the majority of the NRs have lengths between 1 and 2 μm , although separate NRs in length can reach up to 6 μm .

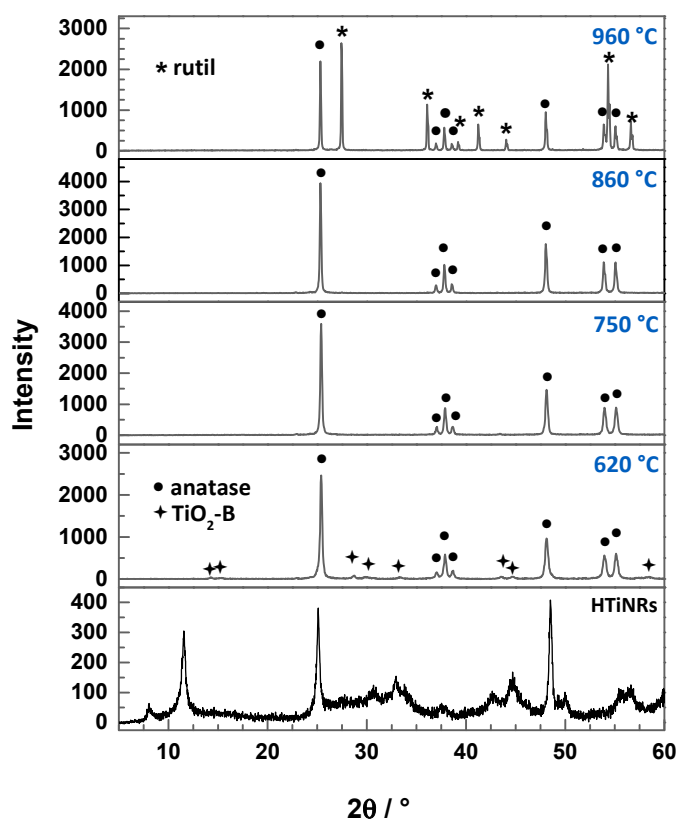


Figure S2. XRD of pristine HTiNRs and products calcined at 620, 750, 860, and 960 °C in air.

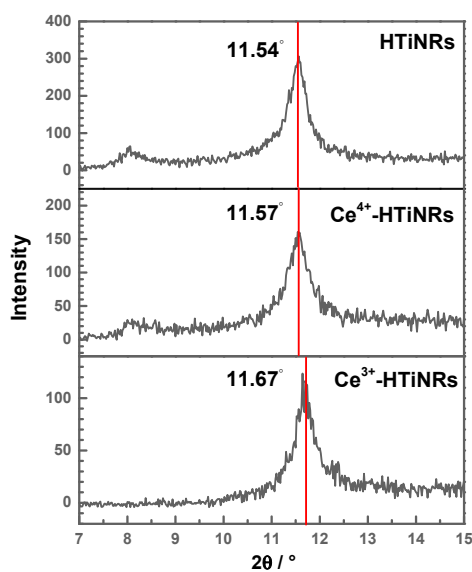


Figure S3. XRD patterns of HTiNRs (top), Ce⁴⁺-HTiNRs (middle), and Ce³⁺-HTiNRs (bottom) between 7 and 15°. Vertical lines guide the eye to easily observe the (100) peak shift to higher angles for Ce³⁺-HTiNRs.

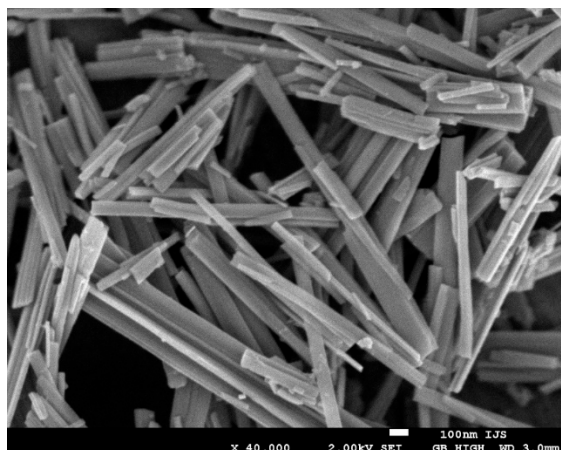


Figure S4. SEM image of HTiNRs impregnated with Ce^{4+} (Ce^{4+} -HTiNRs).

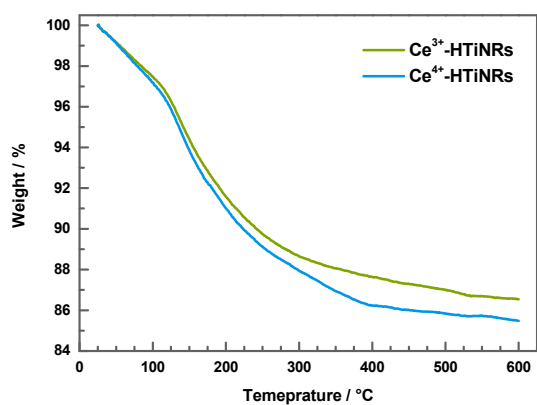


Figure S5. TGA curves for HTiNRs impregnated with Ce^{4+} (Ce^{4+} -HTiNRs) and Ce^{3+} (Ce^{3+} -HTiNRs) measured in air.

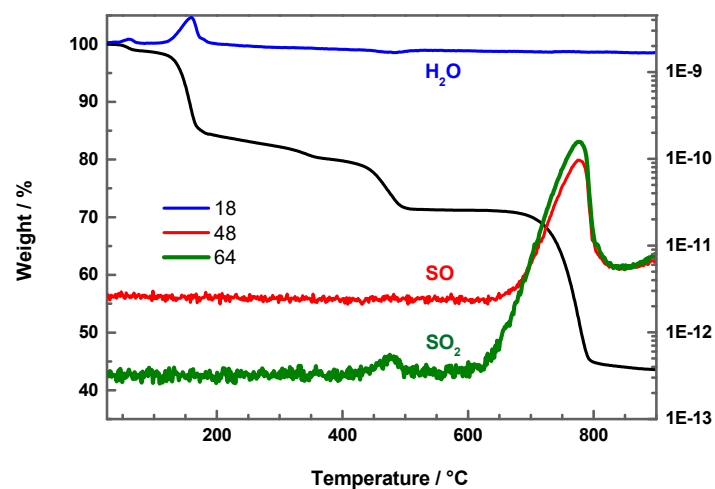


Figure S6. TGA curve of $\text{Ce}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ measured in air and MS of H_2O , SO , and SO_2 . Dehydration of crystalline bonded water takes place in one step and is finished at 200 °C. The decomposition of the sulfate group takes place in two steps. The first step starts at about 430 °C, on further heating the second step starts at about 600 °C. Decomposition of the sulfate group is completed above 800 °C, the final product formed is CeO_2 and represents 43.6 wt. % of the starting mass. The theoretical mass loss for $\text{Ce}(\text{SO}_4)_2 \cdot 2\text{H}_2\text{O}$ is 57.6 wt. % and agrees well with the observed one [65].

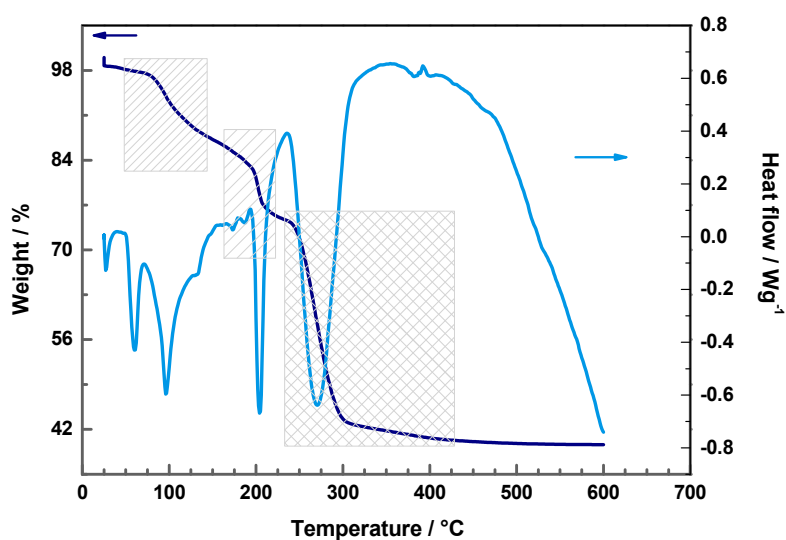


Figure S7. TGA and DSC curves of $\text{Ce}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ measured in air. Complete dehydration of crystalline water in $\text{Ce}_2(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ is finished up to 210 °C, on further heating in the range 230 to 310 °C, decomposition of $\text{Ce}_2(\text{NO}_3)_3$ takes place accompanied by oxidation of Ce^{3+} to Ce^{4+} resulting in the formation of CeO_2 (39,6 wt. % of the starting mass). Theoretical mass loss for $\text{Ce}_2(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ is 60.4 wt. % and agrees well with the observed one [66]

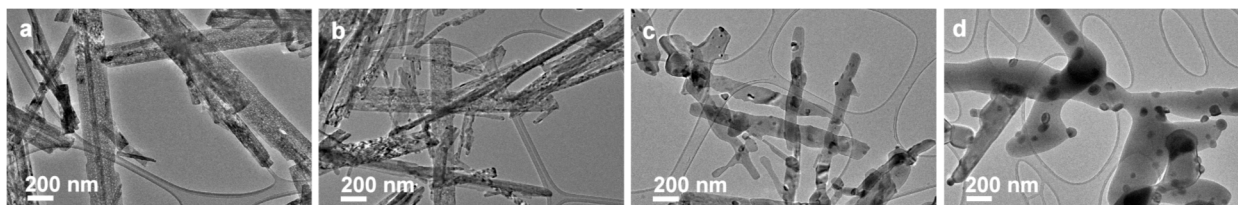


Figure S8. Breakdown of the nanoribbon morphology with increasing calcination temperature for Ce^{4+} -HTiNRs calcined at **a** 620 °C, **b** 750 °C, **c** 860 °C and **d** 960 °C. TEM images were taken at the same magnification.

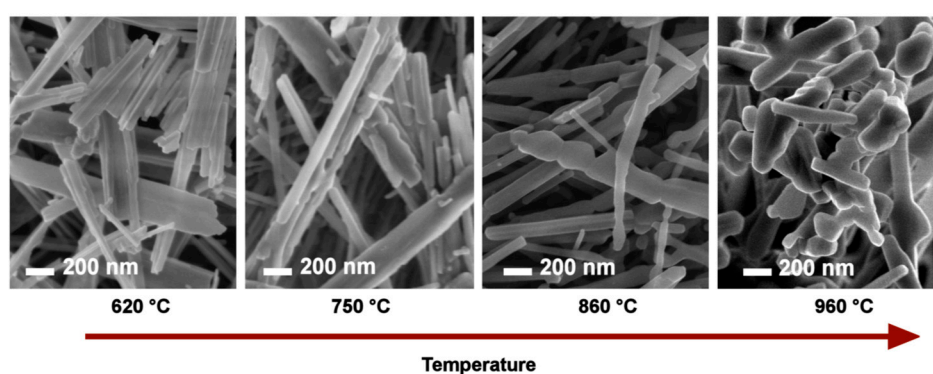


Figure S9. Collapse of the nanoribbon morphology with increasing calcination temperature for HTiNRs calcined at 620 °C, 750 °C, 860 °C, and 960 °C. SEM images were taken at the same magnification with a secondary electron detector.

Figure S10. CeO_2 NPs size distribution for Ce^{4+} -860 °C and Ce^{4+} -960 °C.

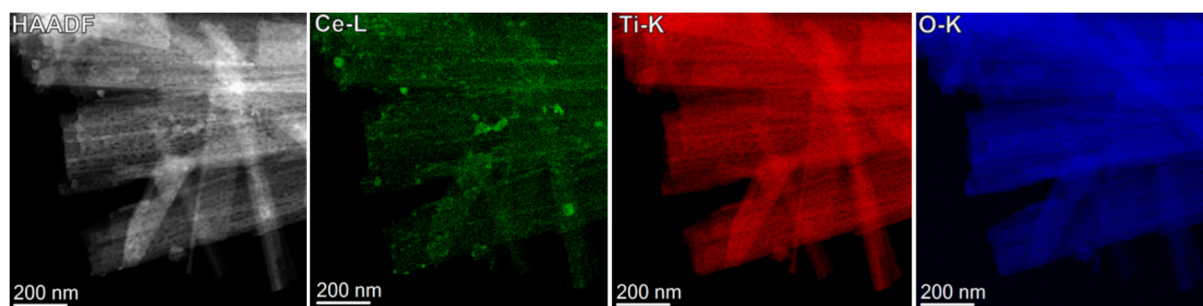


Figure S11. STEM-EDX elemental mapping of Ce⁴⁺-620 °C.