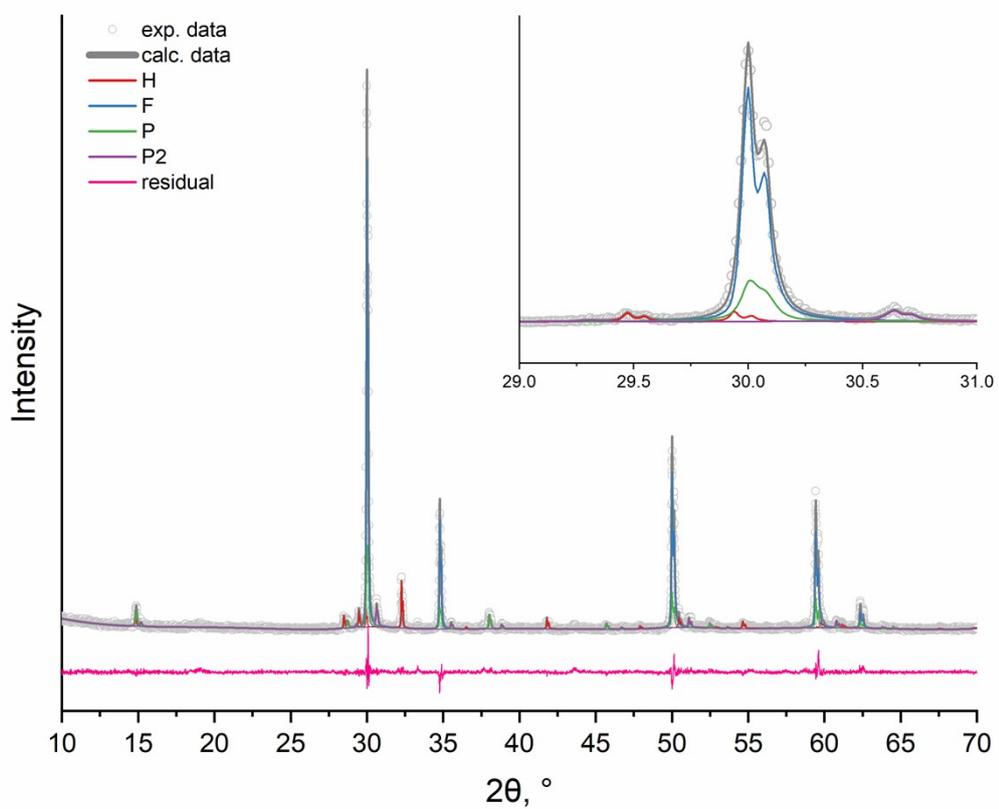
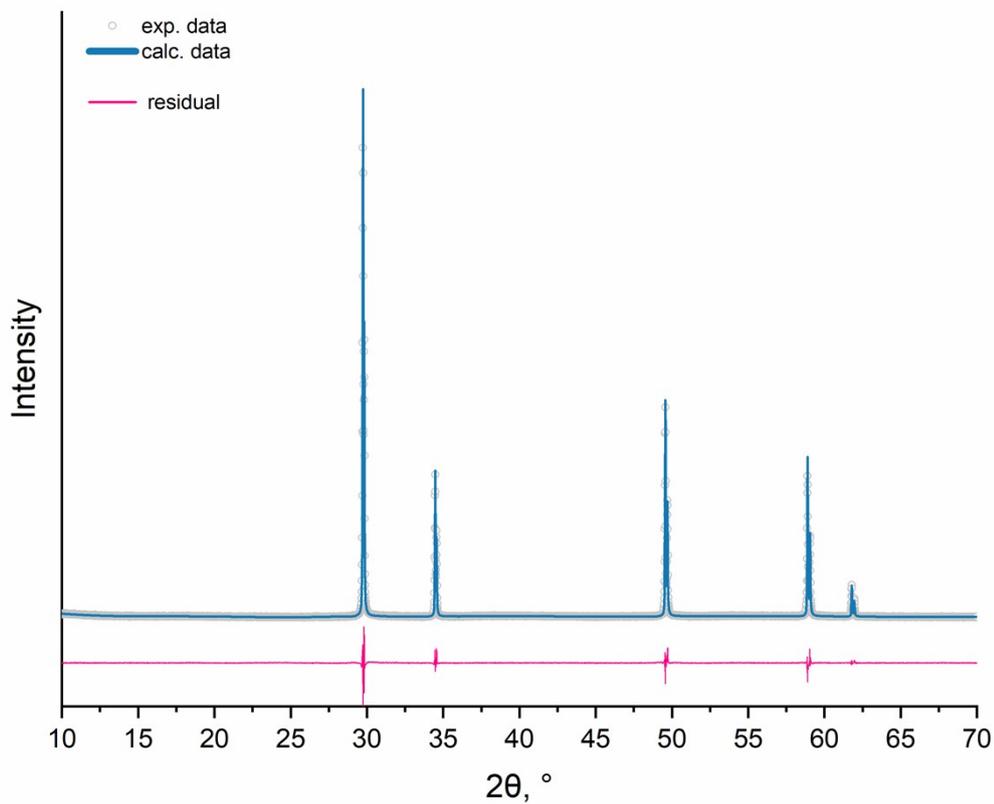


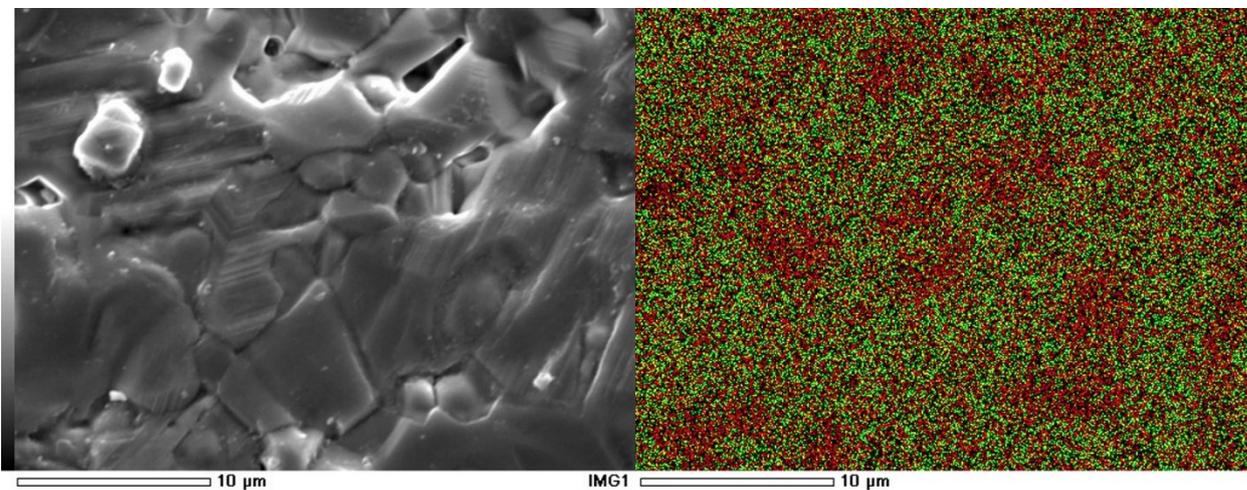
Supplementary materials



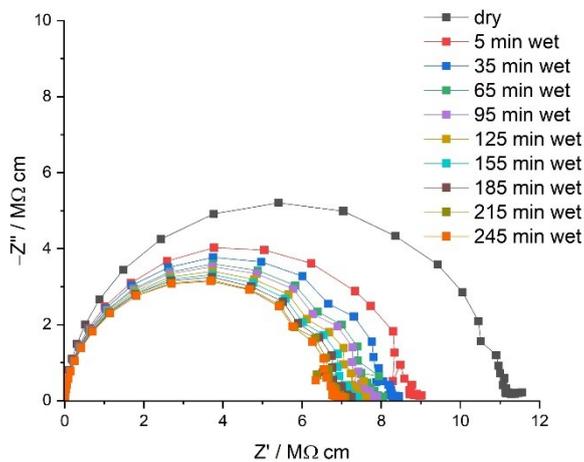
**Fig. S1a** Rietveld refinement of the XRD pattern of the  $(\text{Ho}_x\text{Ti}_{1-x})_4\text{O}_{8-2x}$  ( $x=0.684$ ).



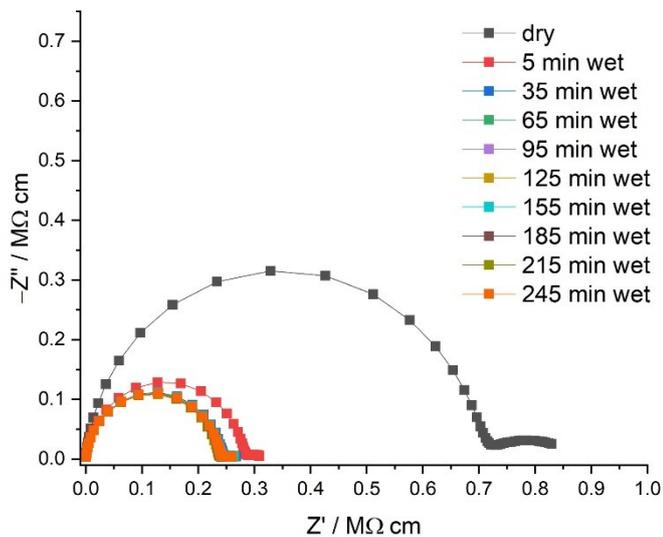
**Fig. S1b** Rietveld refinement of the XRD pattern of the  $(\text{Ho}_x\text{Ti}_{1-x})_4\text{O}_{8-2x}$  ( $x=0.750$ ).



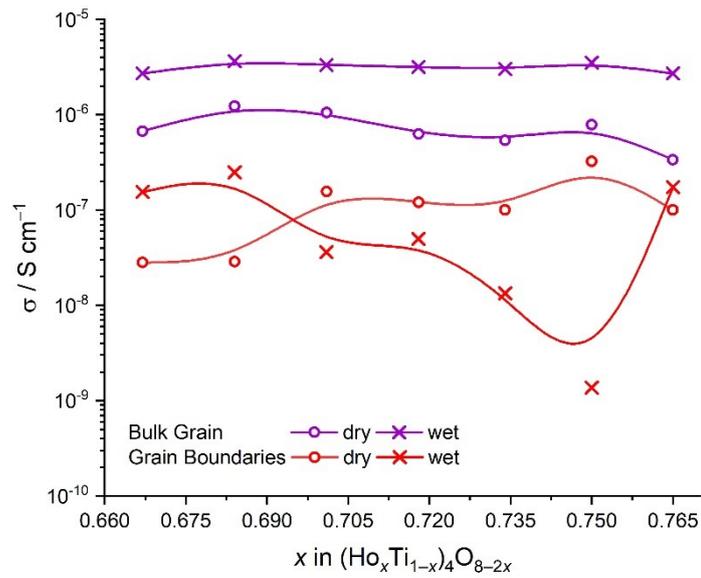
**Fig. S2** SEM image and X-ray mapping of  $(\text{Ho}_x\text{Ti}_{1-x})_4\text{O}_{8-2x}$  ( $x = 0.765$ ) ceramic. Green – Ti. Red – Ho.



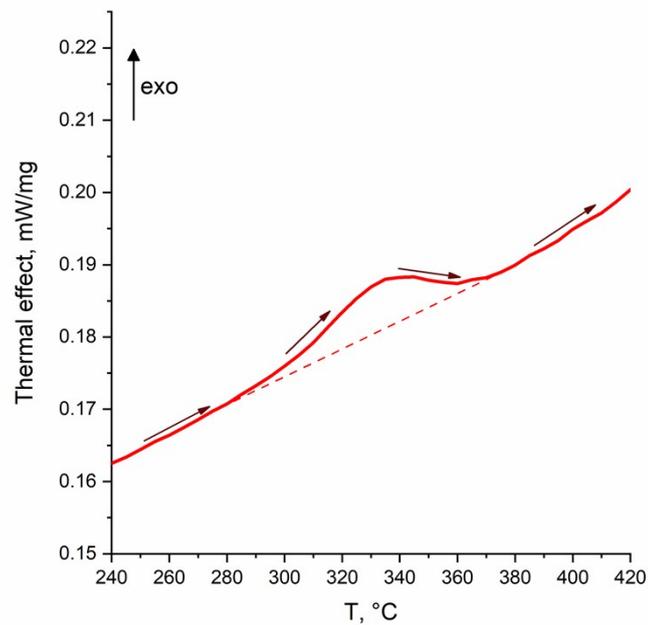
**Fig. S3a** Impedance spectra of the  $\text{Ho}_x\text{Ti}_{1-x}\text{O}_{8-2x}$  ( $x = 0.75$ ), equilibrated in dry air at 300 °C, and measured after changing to wet air and keeping for different times in wet atmosphere.



**Fig. S3b** Impedance spectra of the  $\text{Ho}_x\text{Ti}_{1-x}\text{O}_{8-2x}$  ( $x = 0.75$ ), equilibrated in dry air at 450 °C, and measured after changing to wet air and keeping for different times in wet atmosphere.



**Fig. S3c** Bulk ( $\sigma_b$ ) and specific grain-boundary conductivity ( $\sigma_{gb}^{sp} = (C_1/C_2) \times \sigma_{gb}^{app}$ ) as a function of  $x$ .



**Fig. S4** DSC data for the first heating of the sample  $(Ho_xTi_{1-x})_4O_{8-2x}$  ( $x = 0.750$ ) without pre-hydration.