Unravelling Chemical Pathways of H_2 on Ga_2O_3 surfaces with Spectro-Electrochemistry

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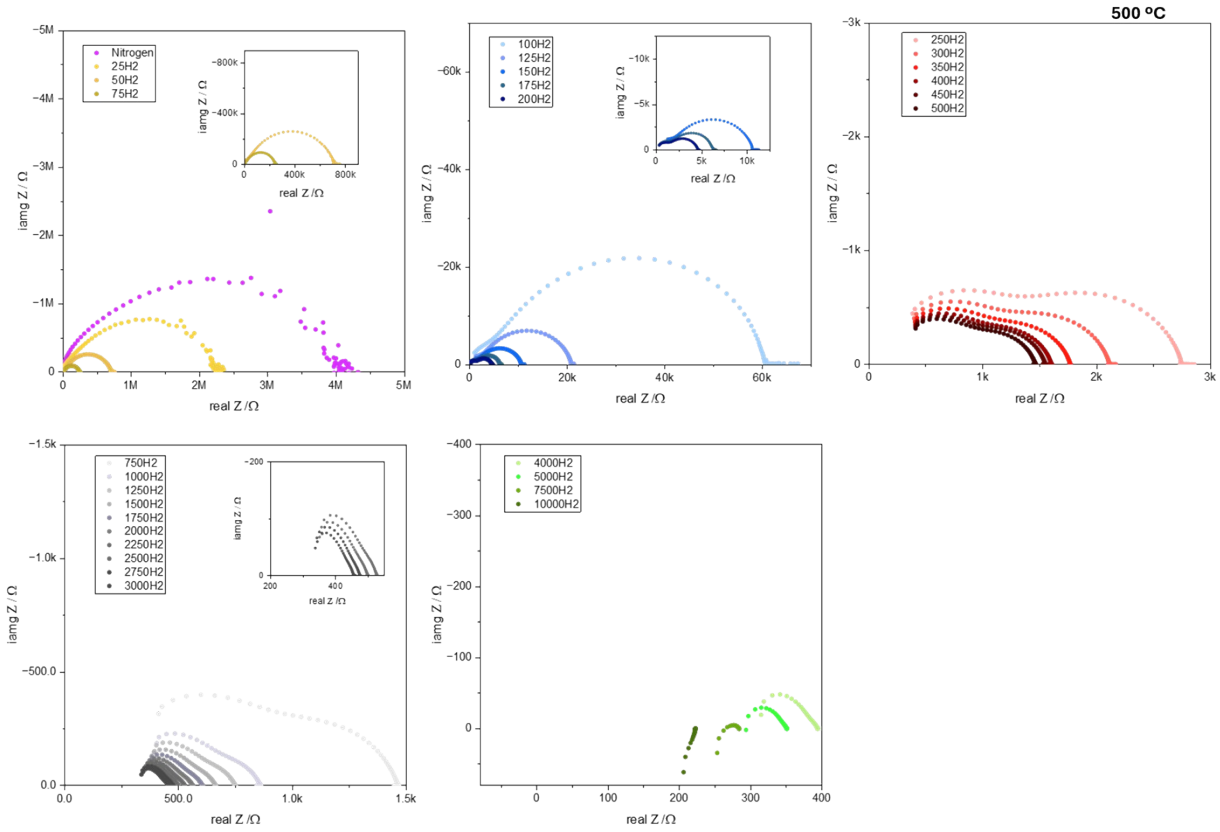
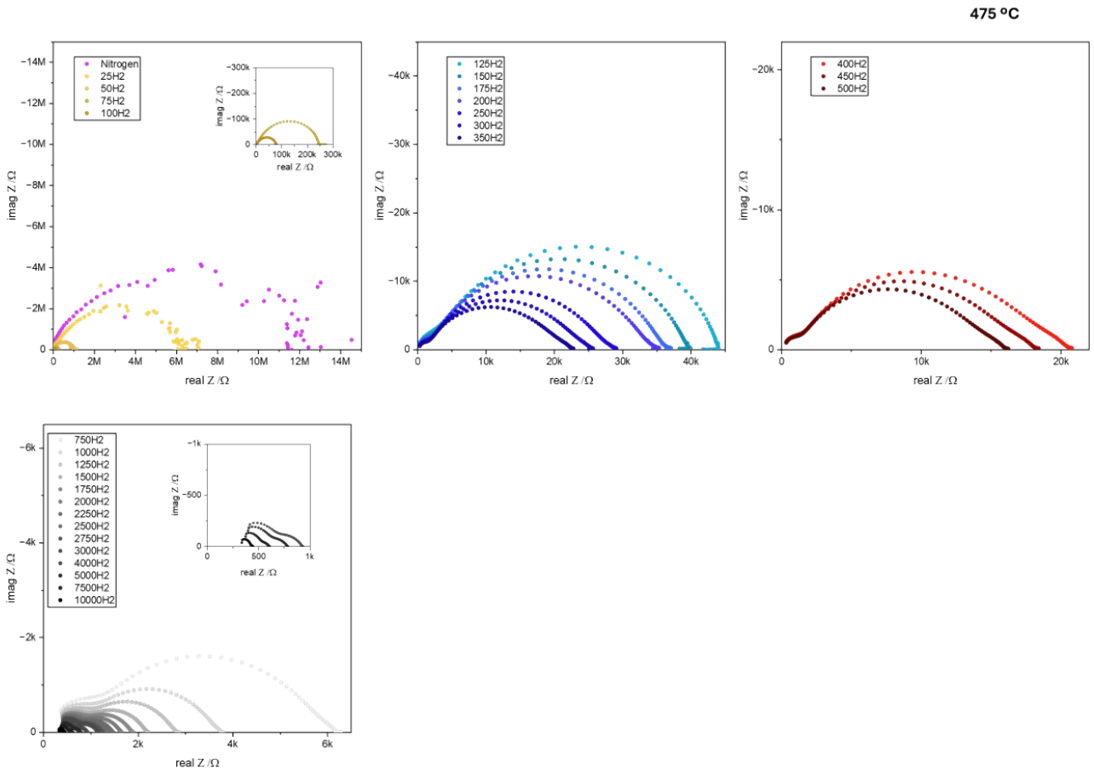
Nyquist Plots

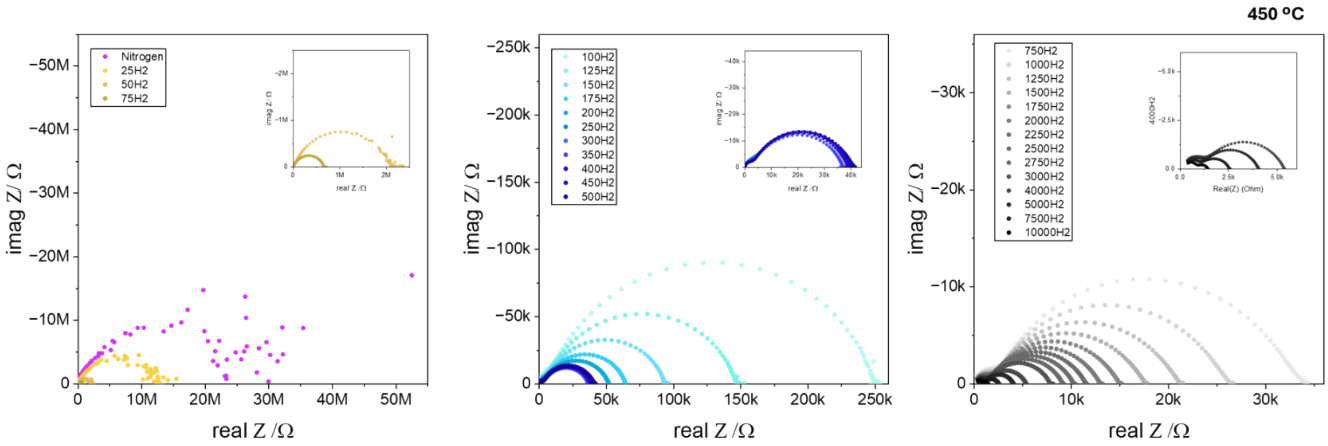
The impedance data taken at each gas concentration after 2 h of stabilization is shown in Figures S.1 to S.3.



SI 1 Nyquist plots taken of the Ga_2O_3 layer during exposure to hydrogen in nominal nitrogen at 500 °C.

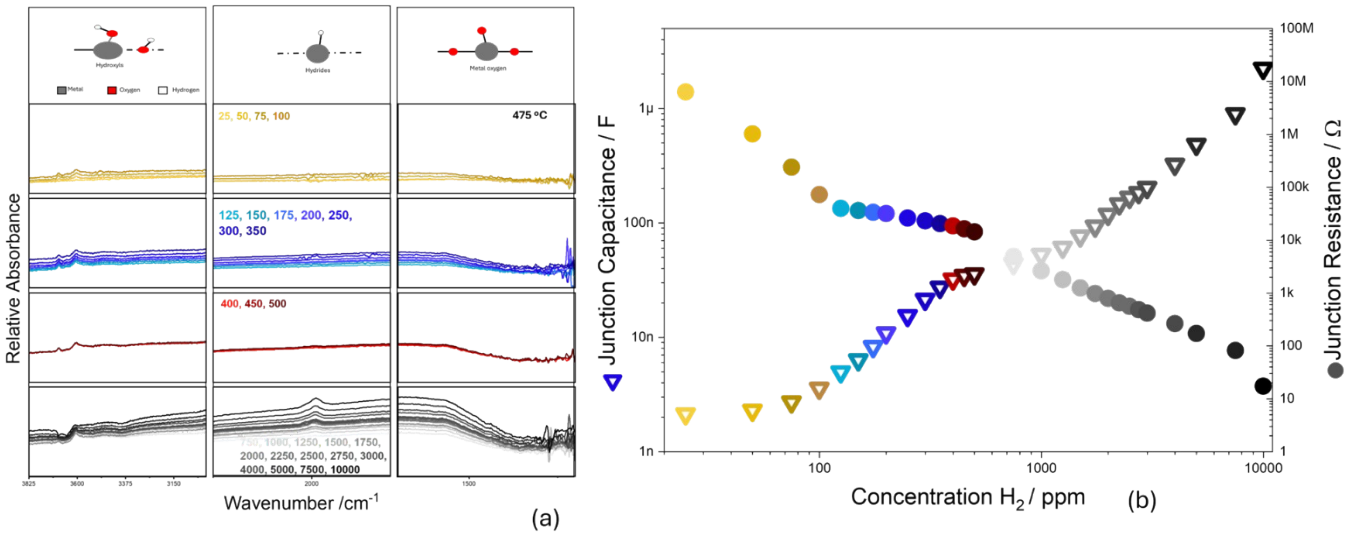


SI 2 Nyquist plots taken of the Ga_2O_3 layer during exposure to hydrogen in nominal nitrogen at 475 °C.

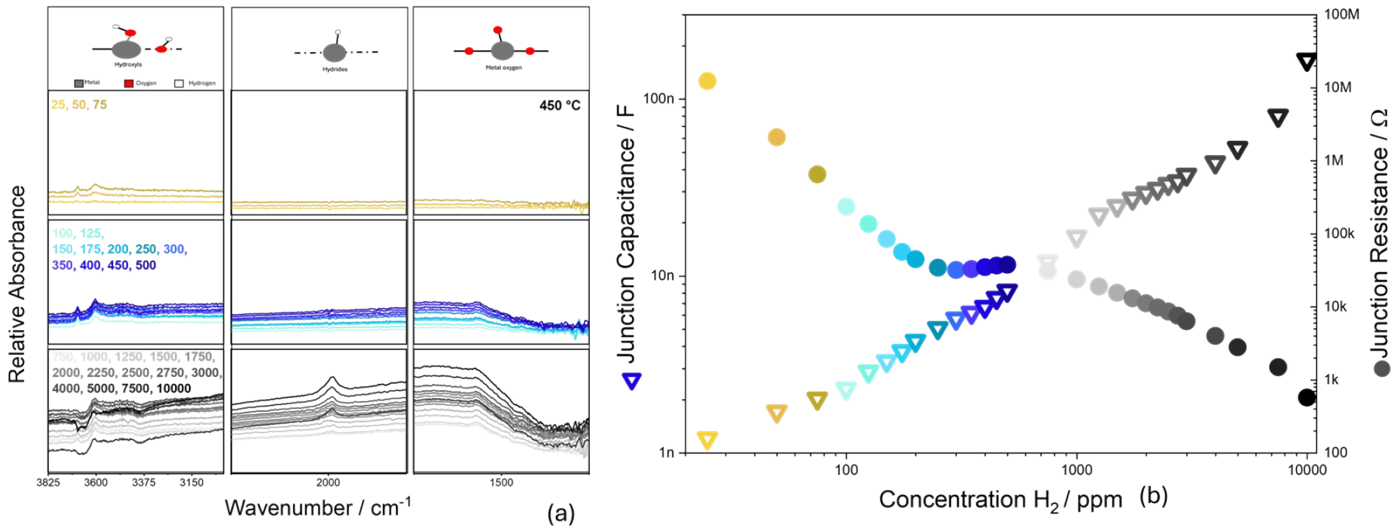


SI 3 Nyquist plots taken of the Ga_2O_3 layer during exposure to hydrogen in nominal nitrogen at 450 °C.

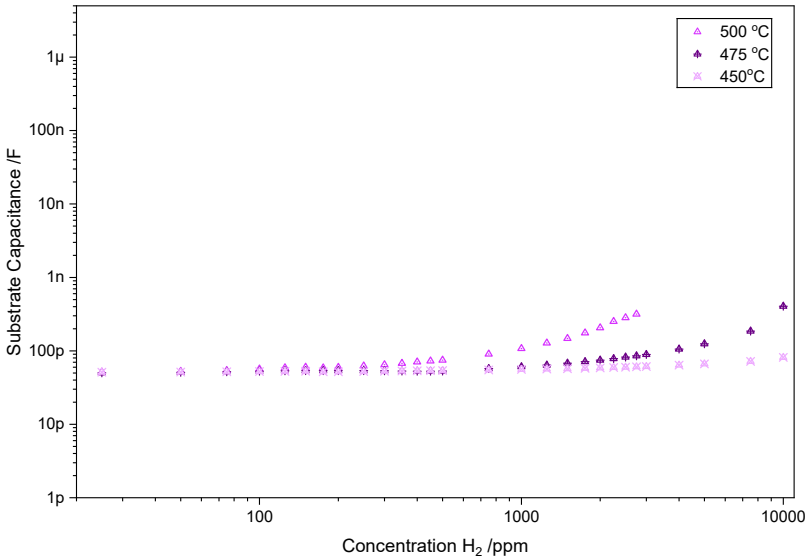
DRIFTS & EIS results @ 475 °C and 450 °C:



SI 4 (a) DRIFT relative absorbance spectra overview of the Ga_2O_3 sample at 475 °C during exposure to different concentration of hydrogen in nominal nitrogen (~90 ppm O_2 measured in exhaust). (b) Overview of inter-grain junction resistance and capacitance extrapolated from the impedance measurements measured simultaneously to the IR spectra.



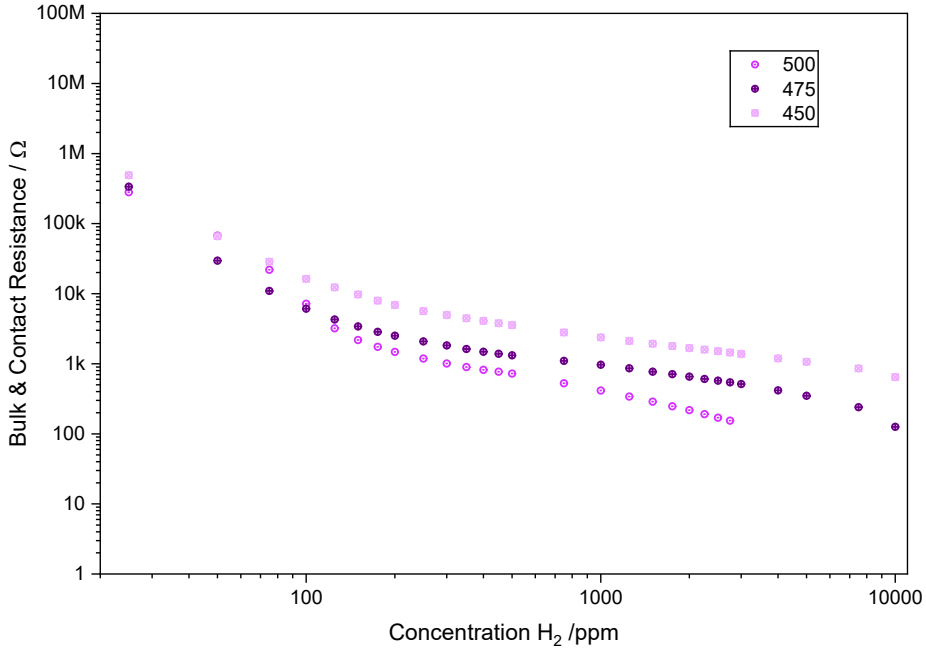
SI 5 (a) DRIFT relative absorbance spectra overview of the Ga_2O_3 sample at 450 °C during exposure to different concentration of hydrogen in nominal nitrogen (~90 ppm O_2 measured in exhaust). (b) Overview of inter-grain junction resistance and capacitance extrapolated from the impedance measurements measured simultaneously to the IR spectra.



SI 6 Substrate geometric capacitance at different temperatures extrapolated from the impedance measurements measured simultaneously to the IR spectra.

Substrate Capacitance:

Bulk & Electrode Contact resistance:



SI 7 Overview of bulk and contact resistance extrapolated from the impedance measurements measured simultaneously to the IR spectra.

Recovery at 500 ºC:

500 ºC	Substrate Capacitance(F)	Junction Capacitance (F)	Junction Resistance(Ω)	Bulk Resistance(Ω)	Offset-Resistance(Ω)
Nitrogen: Before Hydrogen Dosing	5.1398E-11	1.8085E-09	3.48E+06	6.89E+05	181.1
Recovery: After Hydrogen Dosing	4.96E-11	2.38E-09	4.40E+06	6.08E+05	91.47

SI 8 Summary of the impedance of β-Ga_2O_3 sensing layer before and after the hydrogen dosing at 500 ° C