

# THE EFFECT OF HYDROGEN ON THE PROPERTIES OF DUPLEX STAINLESS STEEL

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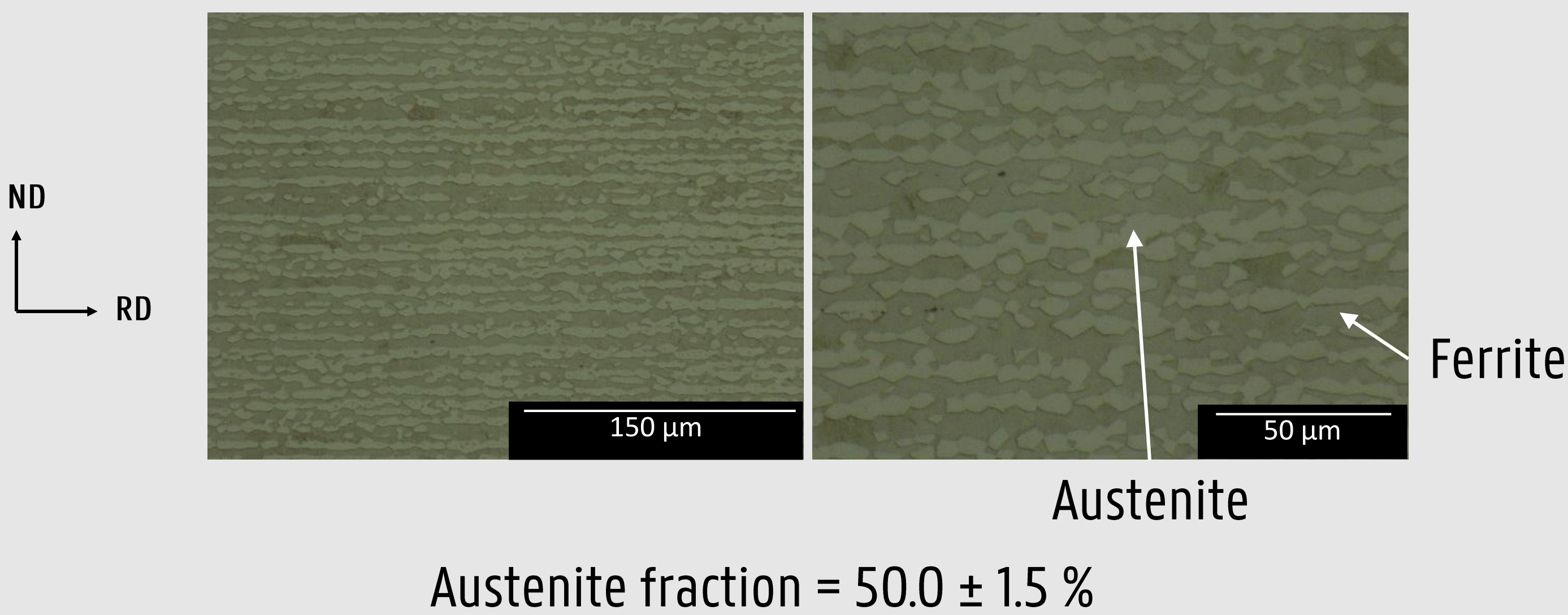
## Introduction

Duplex stainless steels with a two phase austenite/ferrite microstructure have excellent mechanical properties and a high corrosion resistance. However, they are susceptible to hydrogen induced degradation. In this work, the interaction between hydrogen (H) and a 50/50 duplex stainless steel was investigated.

## Material characterisation

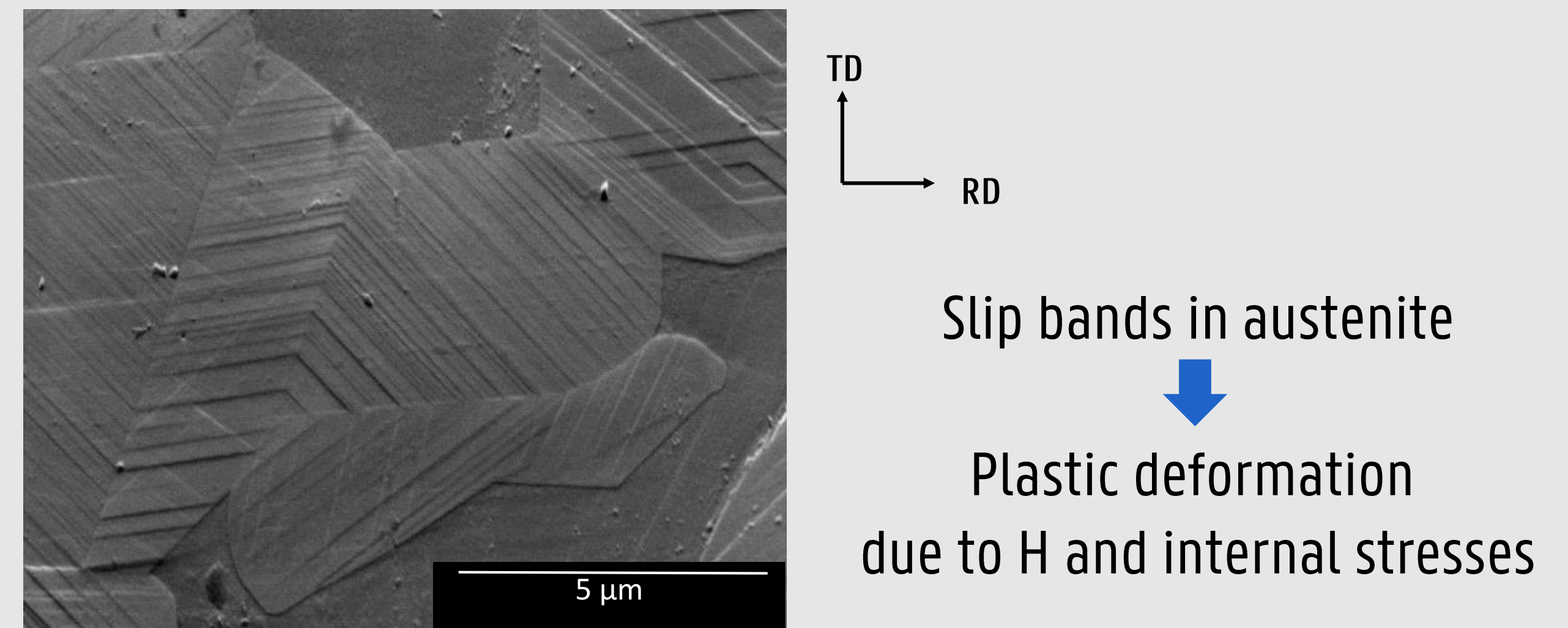
Duplex stainless steel type UNS S32205

	C	Cr	Ni	Mo	Mn	Si	Other
Wt%	0.013	22.45	5.31	2.63	1.81	0.38	Cu 0.24, P 0.02, S 0.005

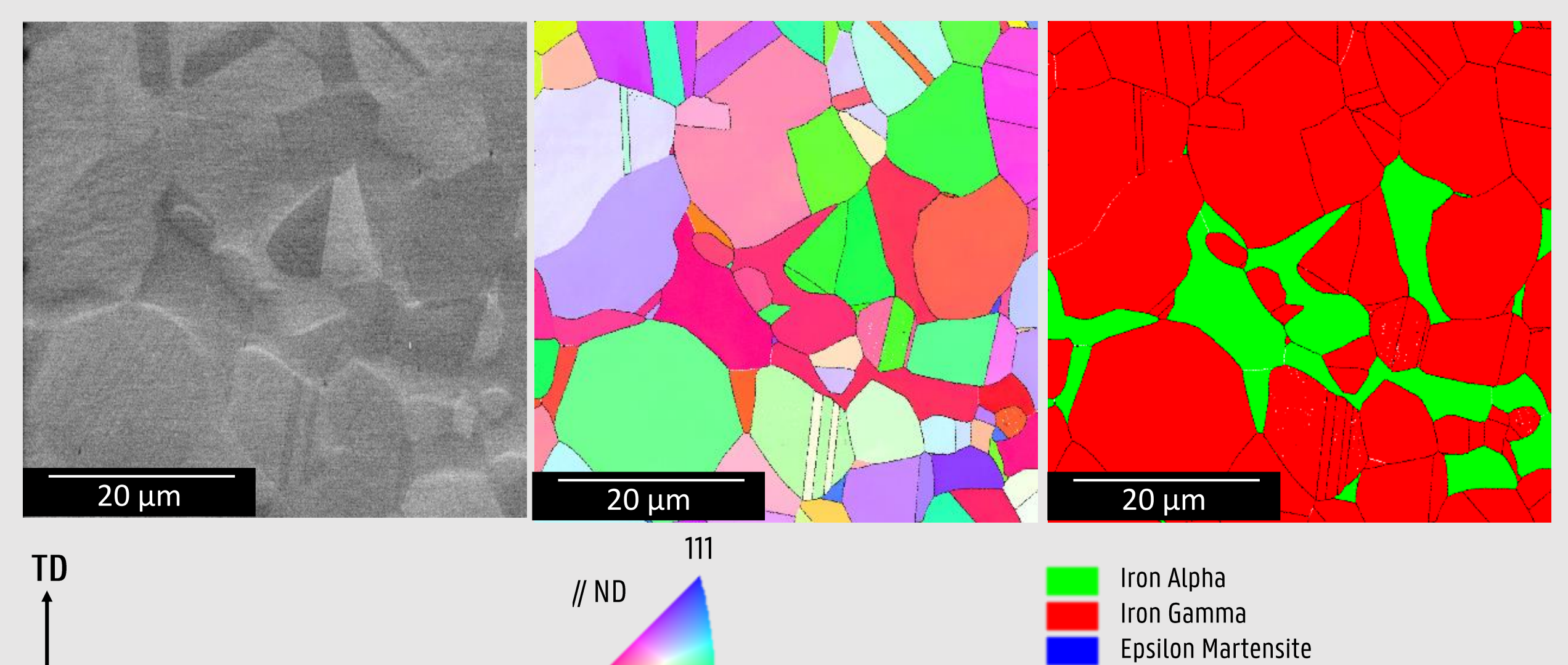


## μ-structural changes during H charging

18 hours of H charging



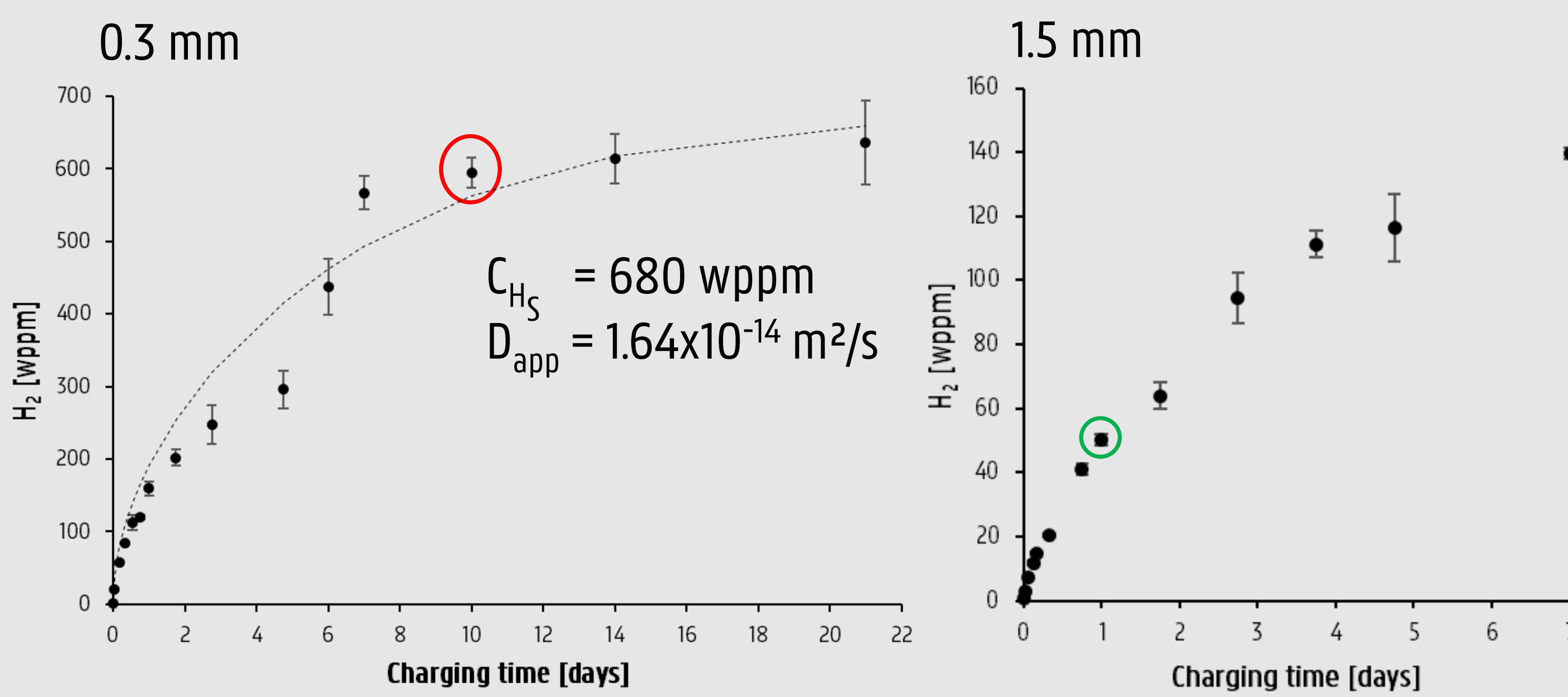
7 days of H charging + polishing



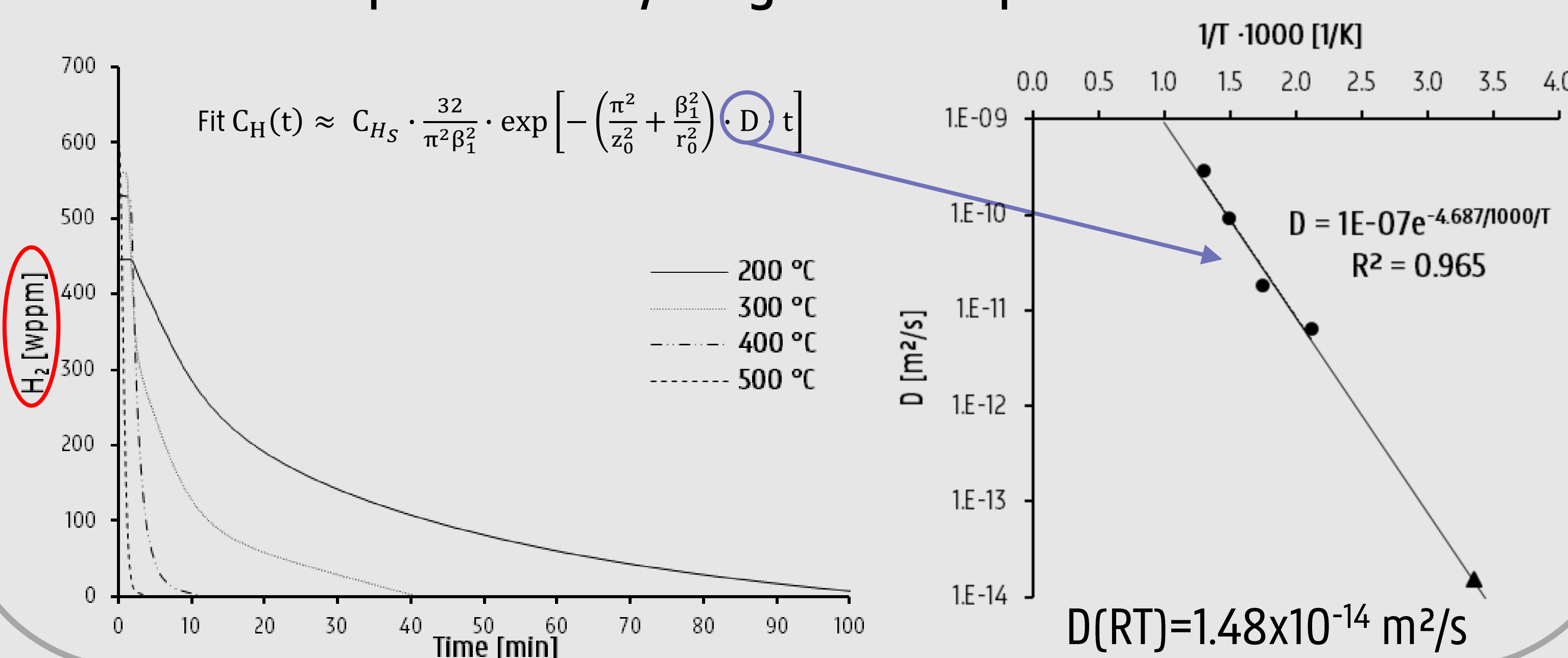
## Hydrogen/metal interaction

0.8 mA/cm<sup>2</sup> in 0.5M H<sub>2</sub>SO<sub>4</sub> and 1 g/l thiourea

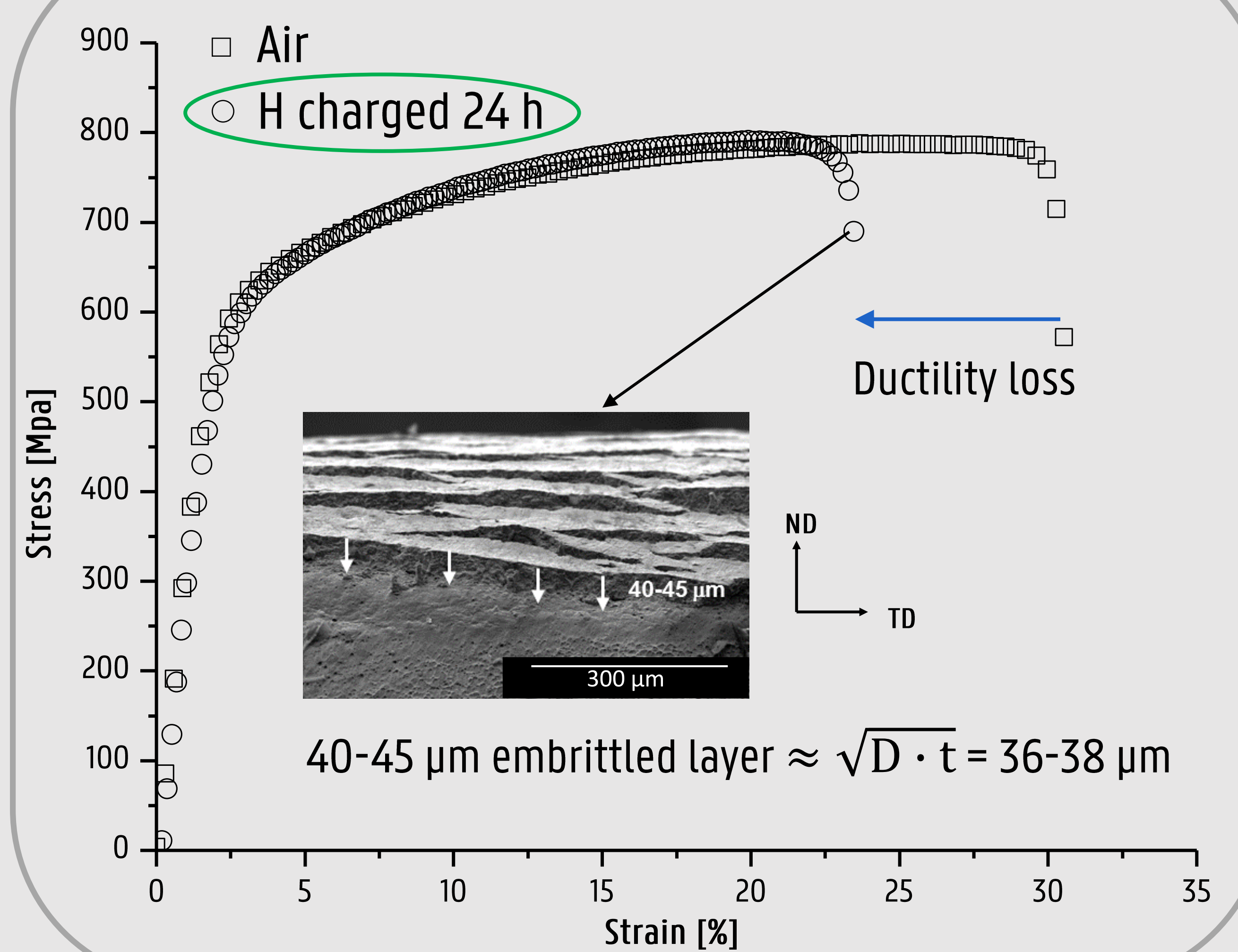
Total hydrogen content (melt extraction)



Constant temperature hydrogen desorption tests



## Mechanical properties



## Conclusions

- A saturation level of 680 wppm was obtained after approximately 10 days of charging
- A diffusion coefficient of  $1.64 \times 10^{-14} \text{ m}^2/\text{s}$  was found by melt extraction;  $1.48 \times 10^{-14} \text{ m}^2/\text{s}$  was found from hydrogen desorption tests
- Slip bands were generated during hydrogen charging
- Correlation between H affected zone and H diffusion distance was found