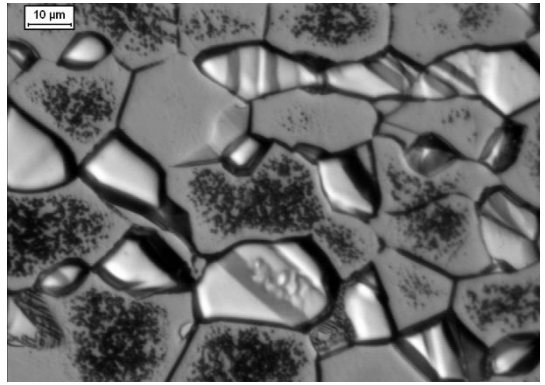
RELATION BETWEEN PITTING POTENTIAL AND PREN VALUES FOR FERRITE AND AUSTENITE IN DUPLEX STAINLESS STEELS

D. C. Santos, I. M. Macarrão,
RODRIGO MAGNABOSCO

Introduction

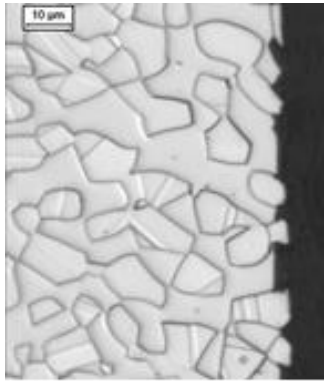
R. Magnabosco et al. 59th ABM International Congress. S. Paulo, Brazil, 2004, p. 435-444.

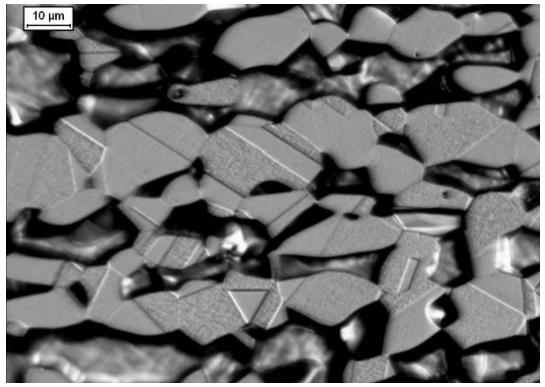
R. Magnabosco et al.
EUROCORR 2009, Nice. CEFRACOR, 2009.

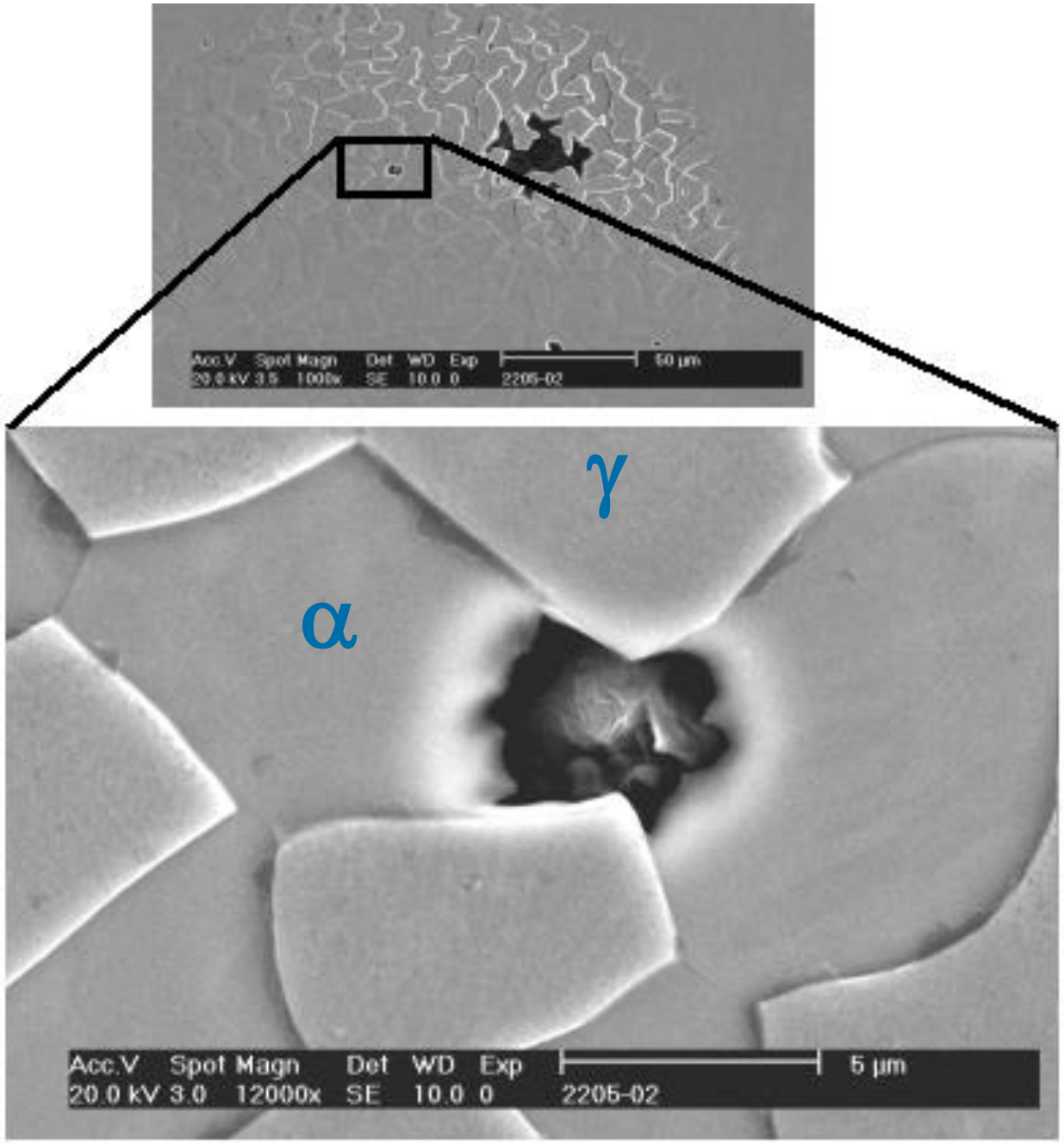


1 M HCl, 60 °C
-243 $mV_{Ag/AgCl}$

1 M HCl, 60 °C, - 332 $mV_{Ag/AgCl}$







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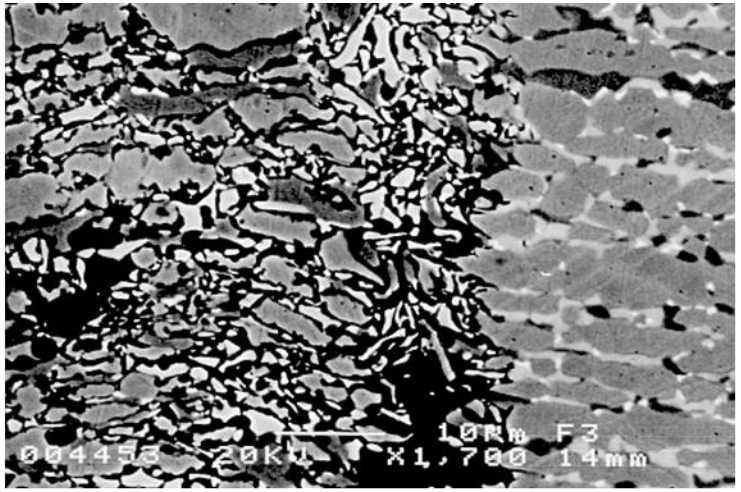
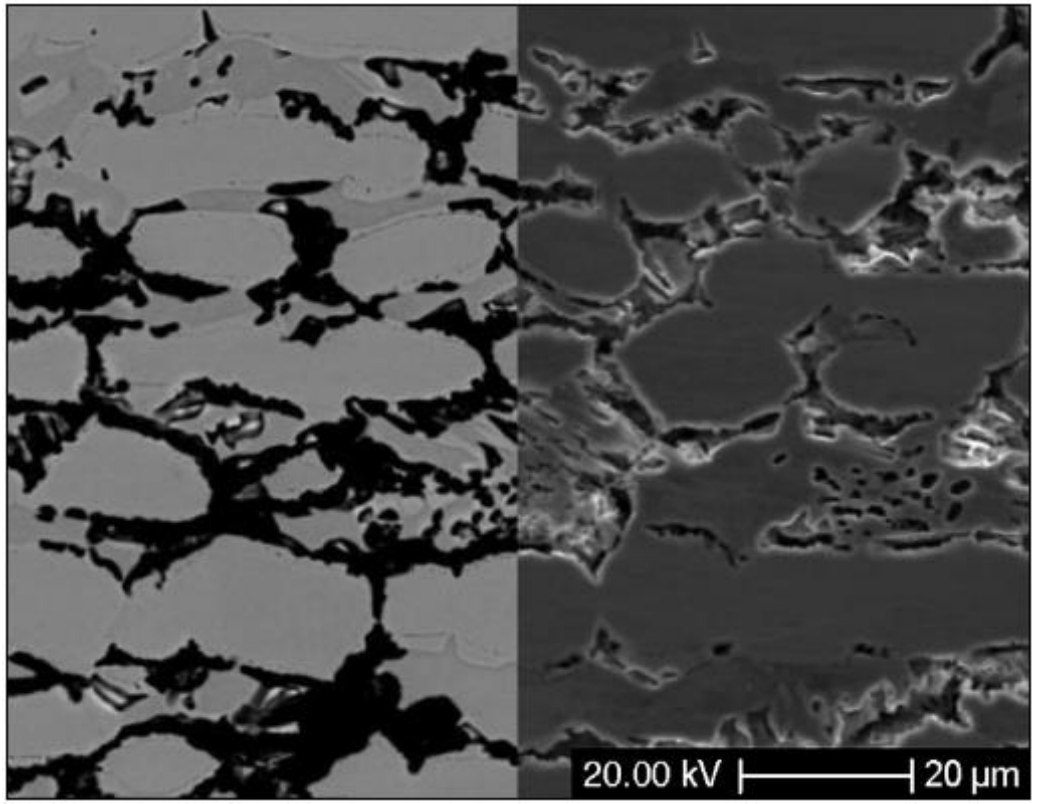


30 min @ 850 °C

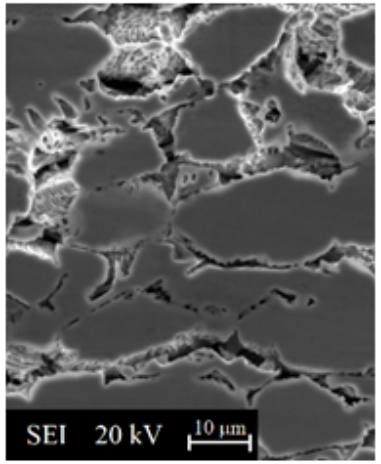
R. Magnabosco, N.Alonso-Falleiros. Pit Morphology and Its Relation to Microstructure of 850°C Aged Duplex Stainless Steel. Corrosion, v. 61, n.2, p. 130, 2005.

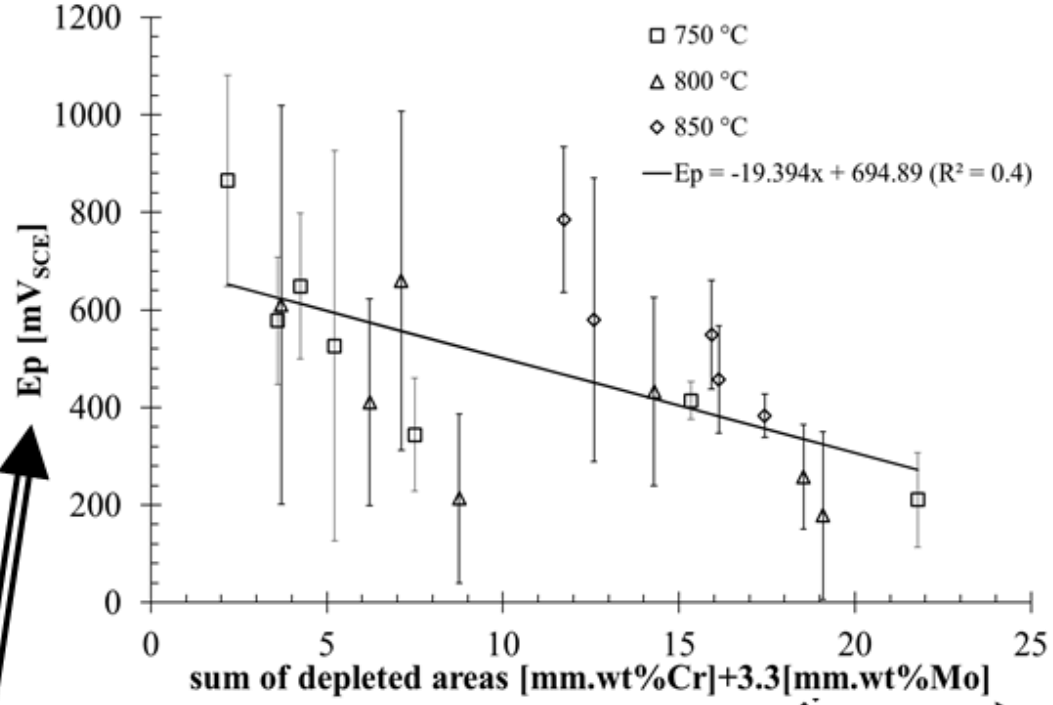


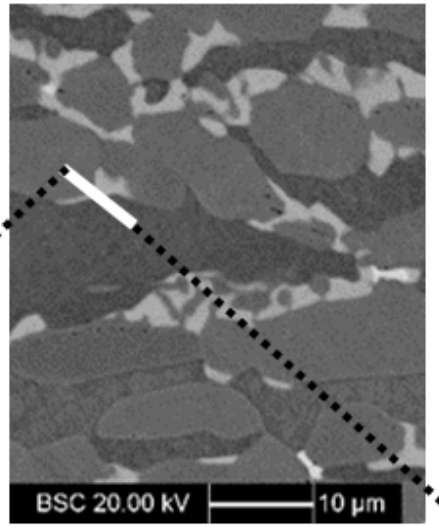
1h @ 850 °C

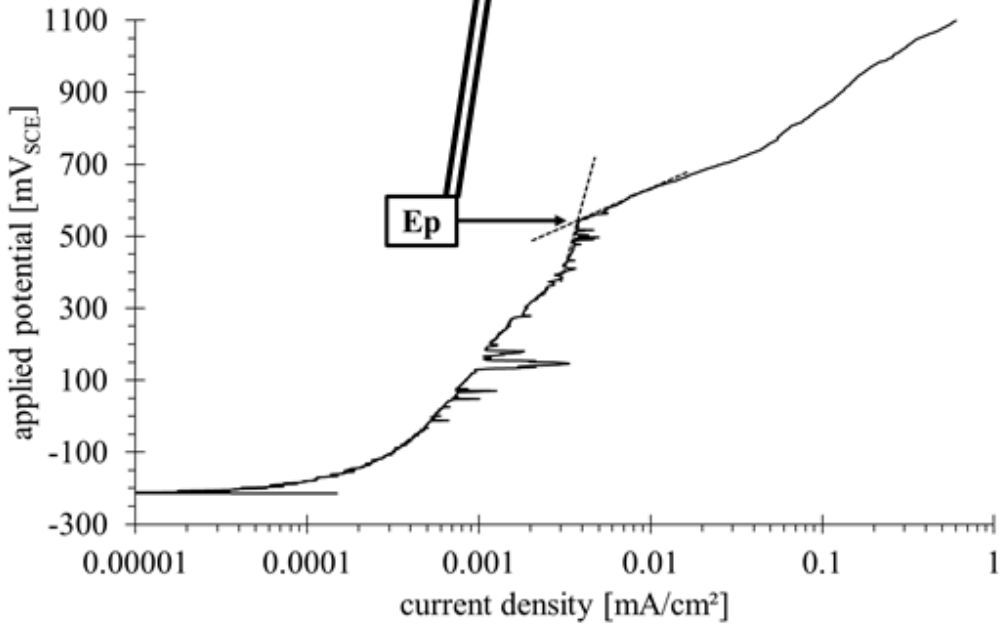
D. C. Santos et al. Influence of sigma phase formation on pitting corrosion of an aged UNS S31803 duplex stainless steel.. CORROSION, v. 69, p. 900-911, 2013.

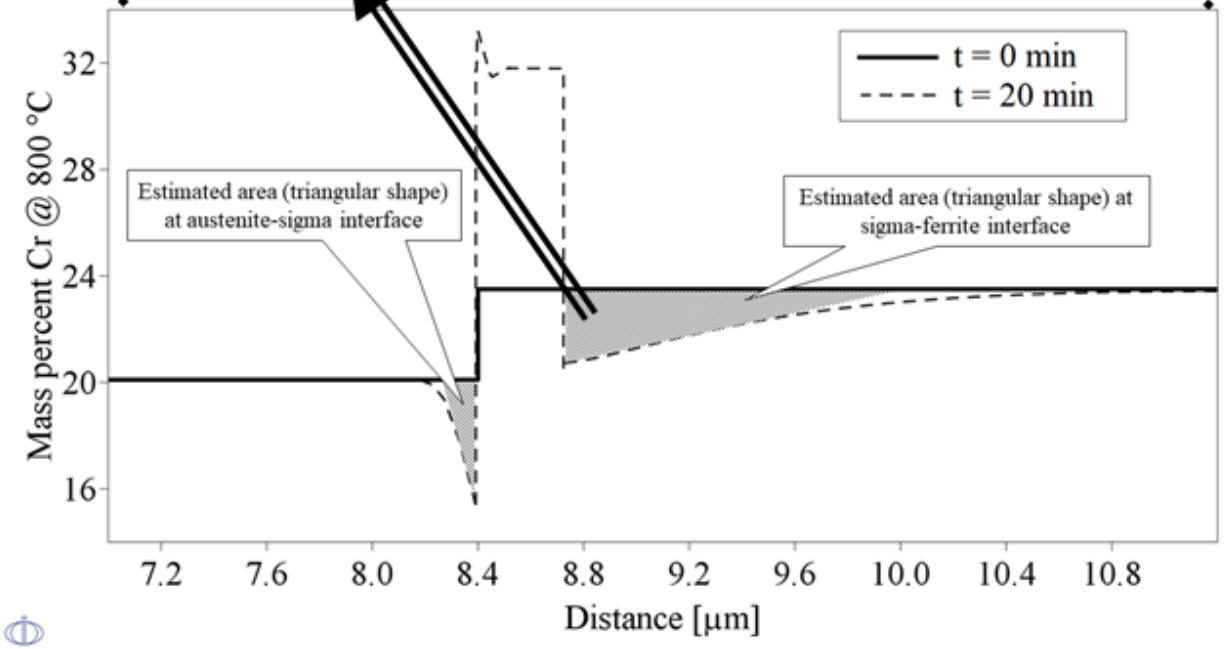
Introduction











Goal

Is there a relationship between pitting potential and $PREN_{\alpha}$ or $PREN_{\gamma}$ in UNS S31803 samples with different volume fractions of ferrite?

Experimental procedure

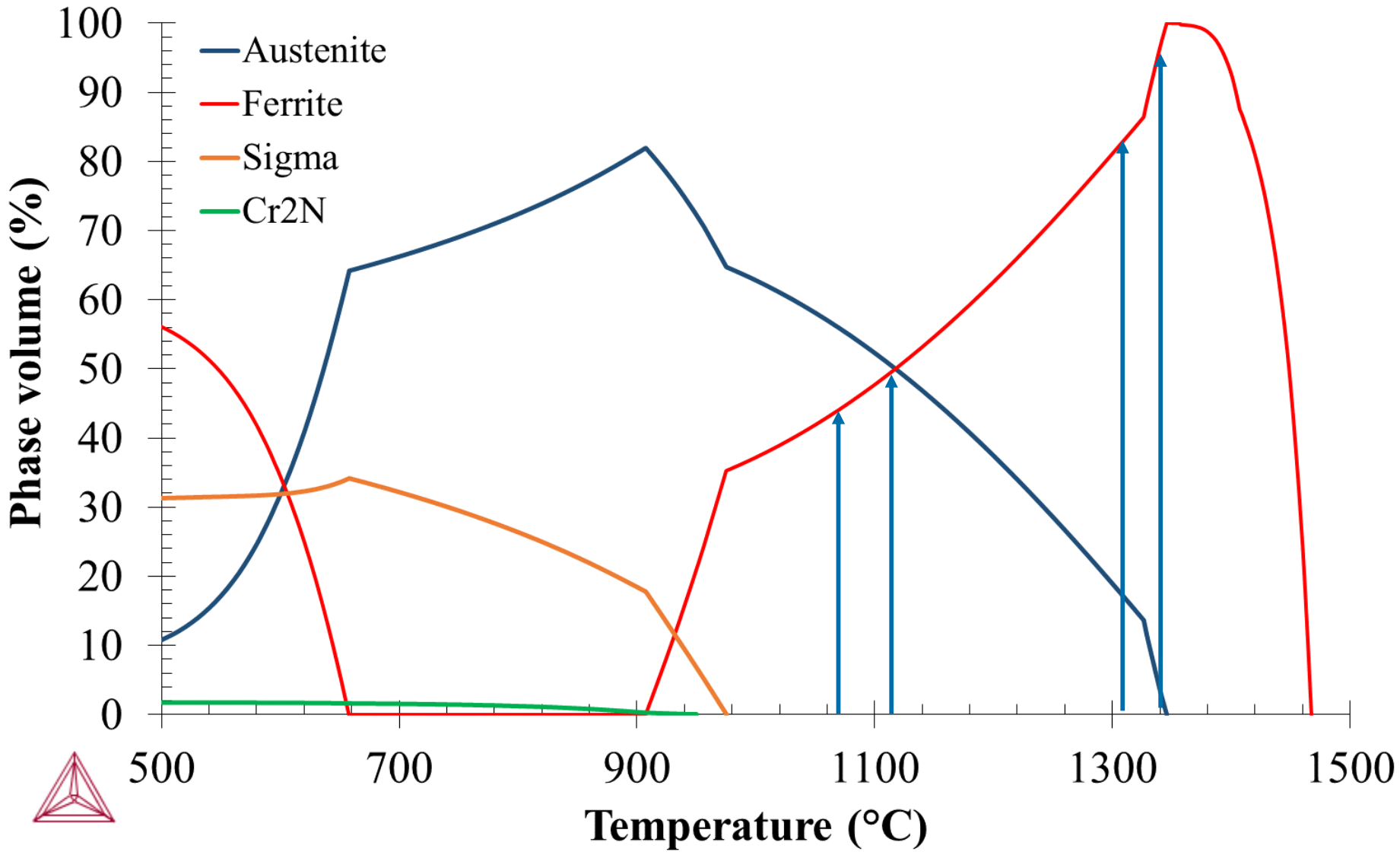
Element	Cr	Ni	Mo	N	Mn	Si	Cu	Fe
wt %	22.5	5.7	3.2	0.16	1.4	0.35	0.15	Balance

- 3 mm sheets, solution-treated 1 h between 1070 and 1340 °C, water quenched
- Optical Microscopy (OM) after modified Beraha etching
- Thermo-Calc® with TCFE8 database for α ou γ chemical composition

$$PREN = \%Cr + 3.3\%Mo + 16\%N$$

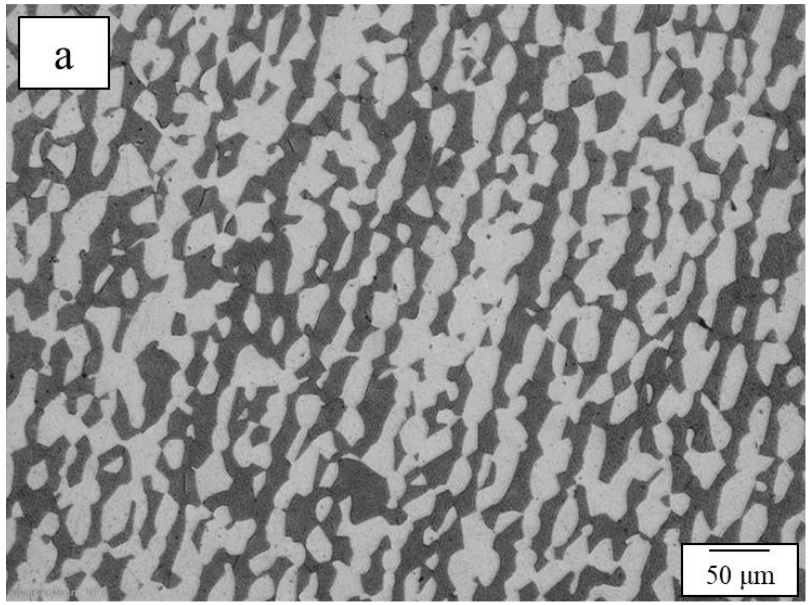
- Potentiodynamic polarisation tests in 0.6 M NaCl @ 75 °C for E_p determination

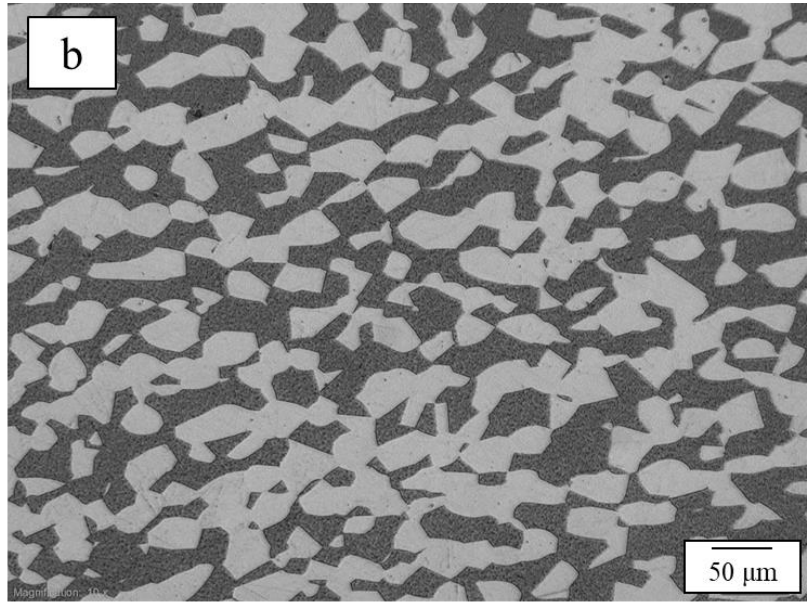
Results and Discussion



Results and Discussion

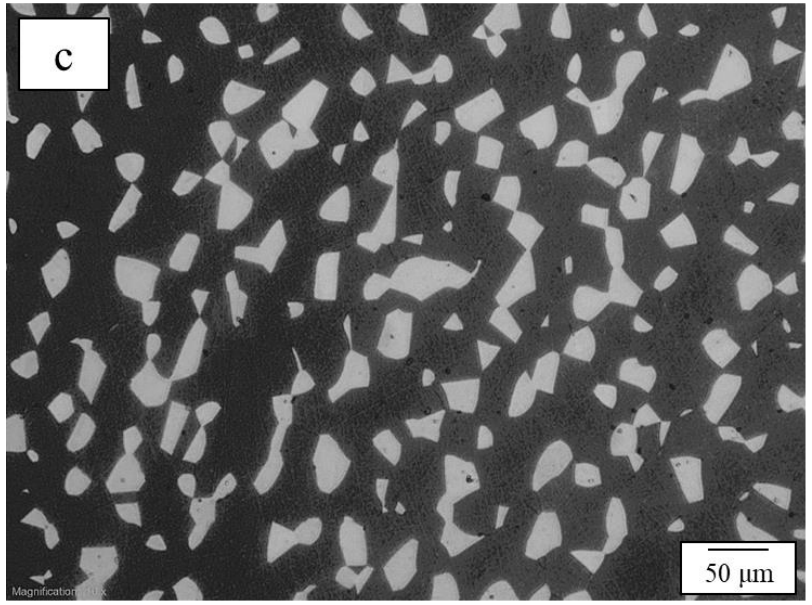
1070 °C
44.9 ± 2.8 %α

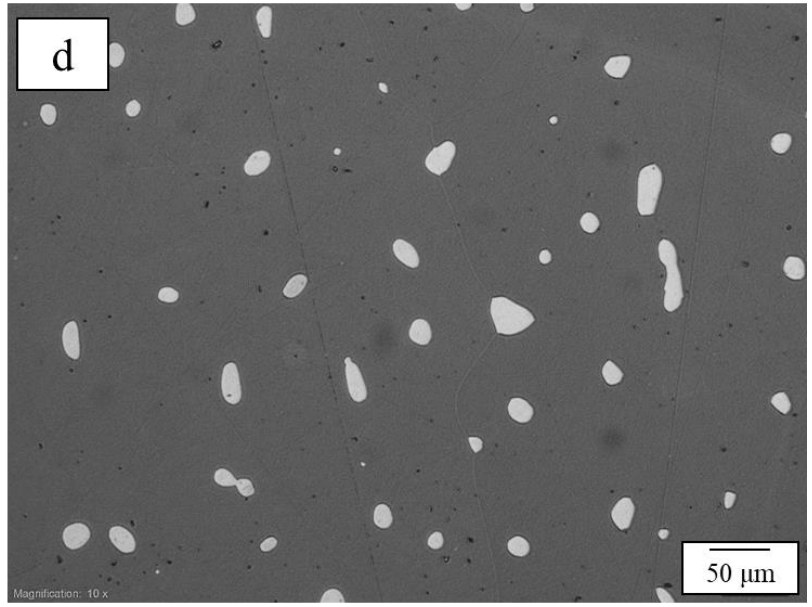




1110 °C
49.0 ± 3.8 %α

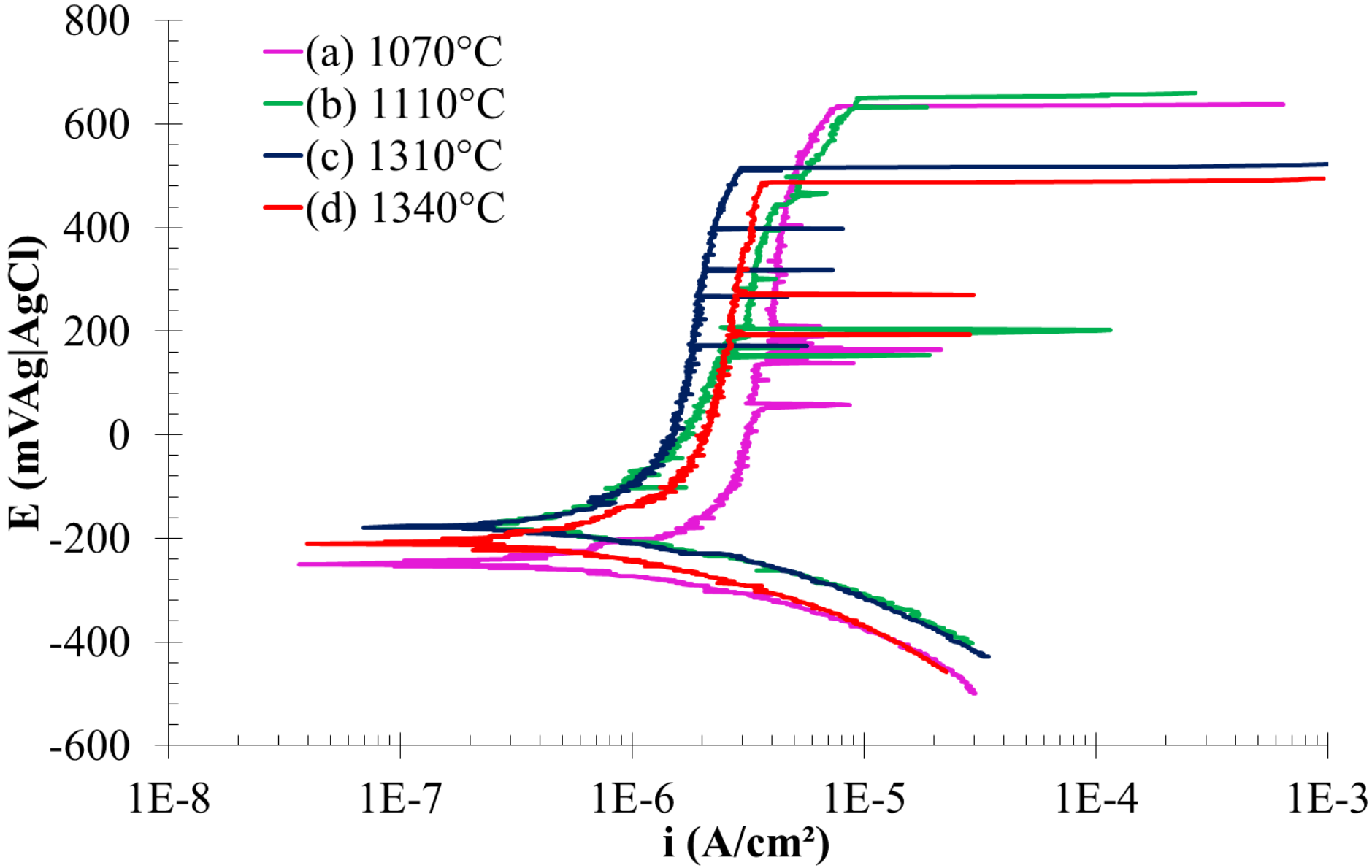
1310 °C
82.7 ± 1.9 %α





1340 °C
96.6 ± 1.4 %α

Results and Discussion



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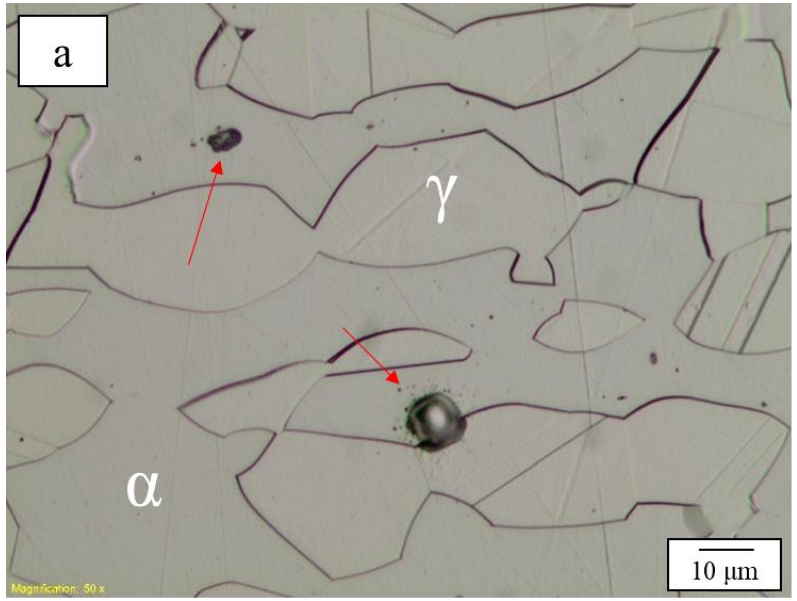

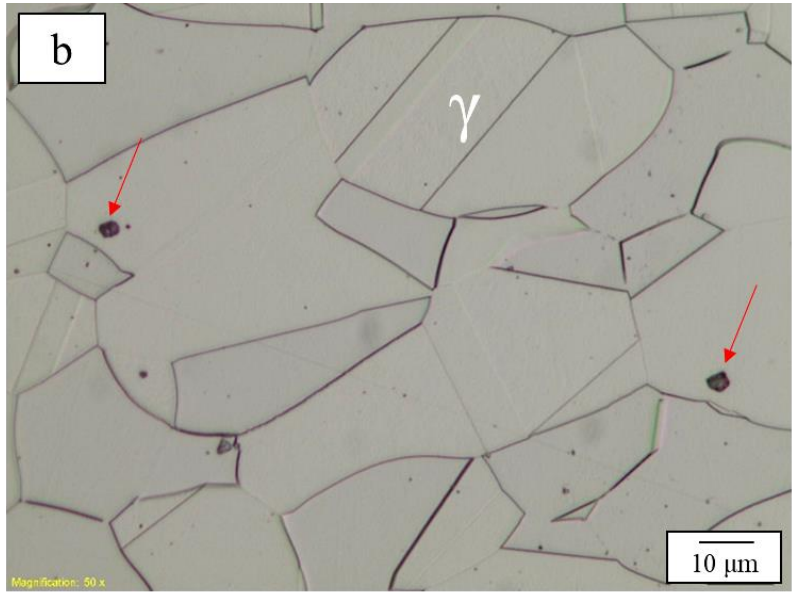

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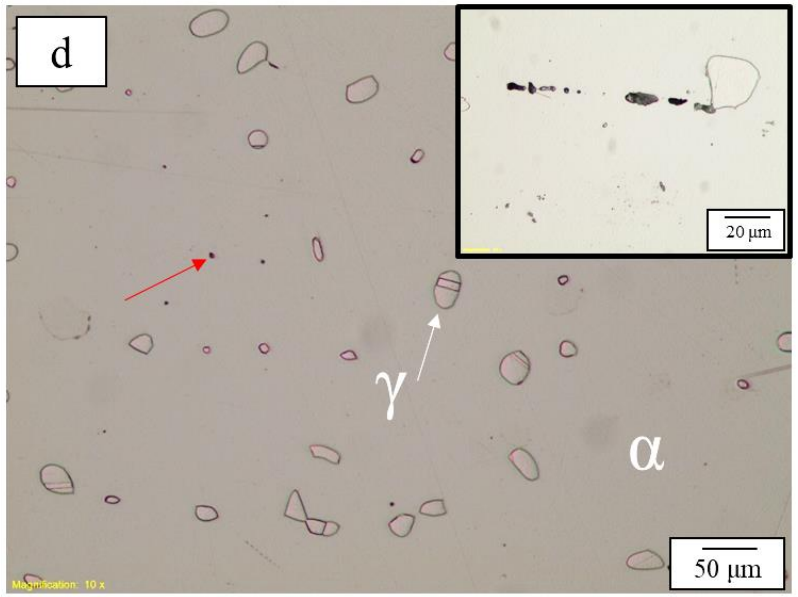

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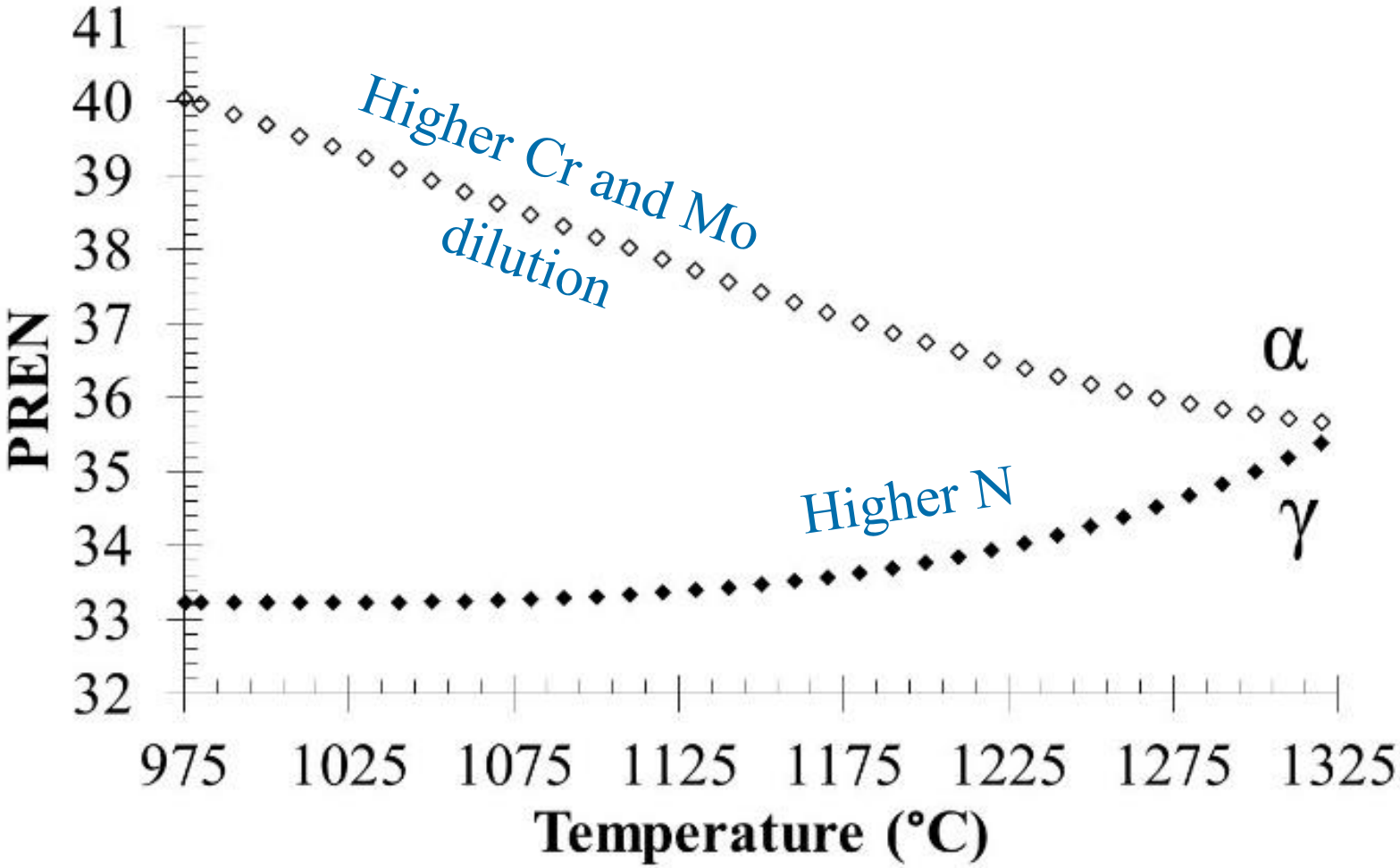

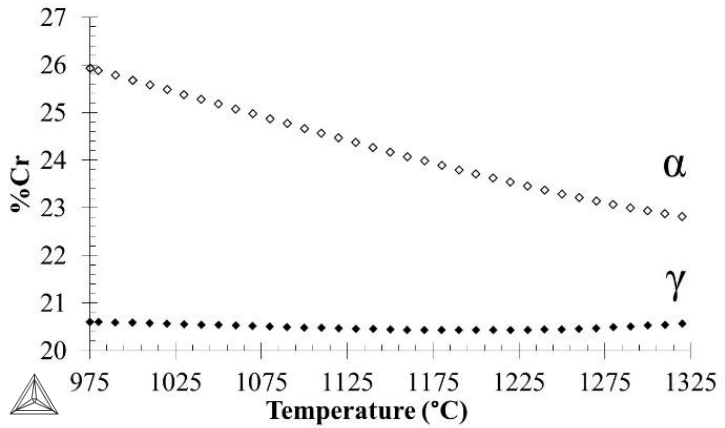

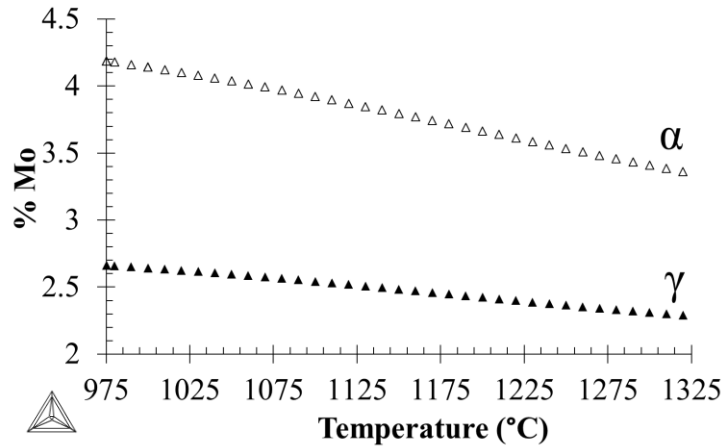

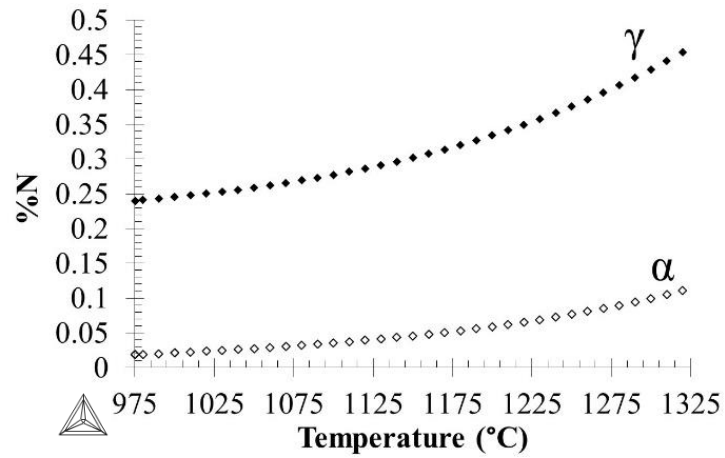

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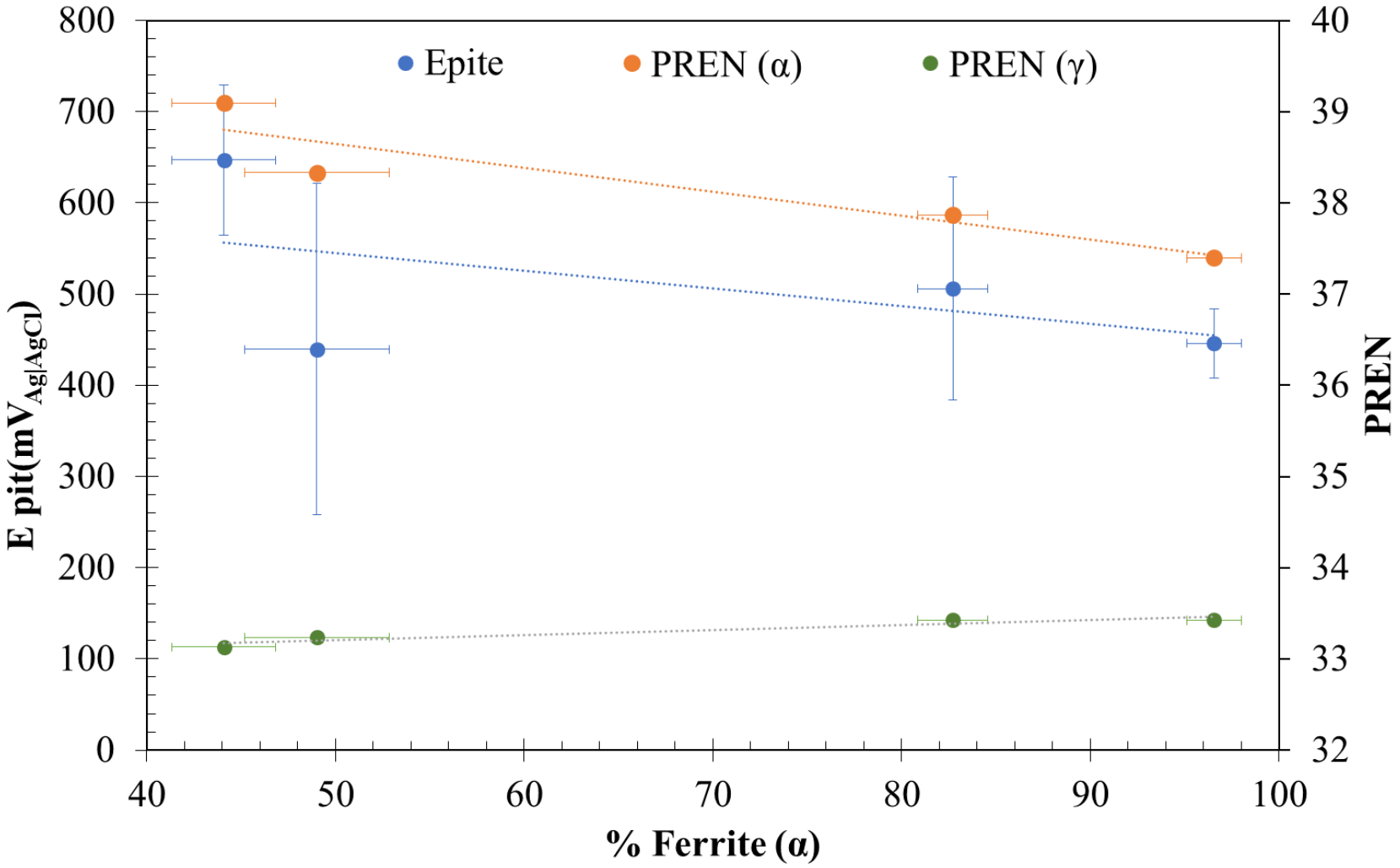

Conclusions

- $PREN_{\alpha}$ is higher than $PREN_{\gamma}$ between 975 and 1300 °C
- Slight reduction of pitting potential with increasing α content – Cr & Mo dilution in α
- Pits preferably found in α
- PREN comparison between different phases is not possible

Acknowledgements

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