



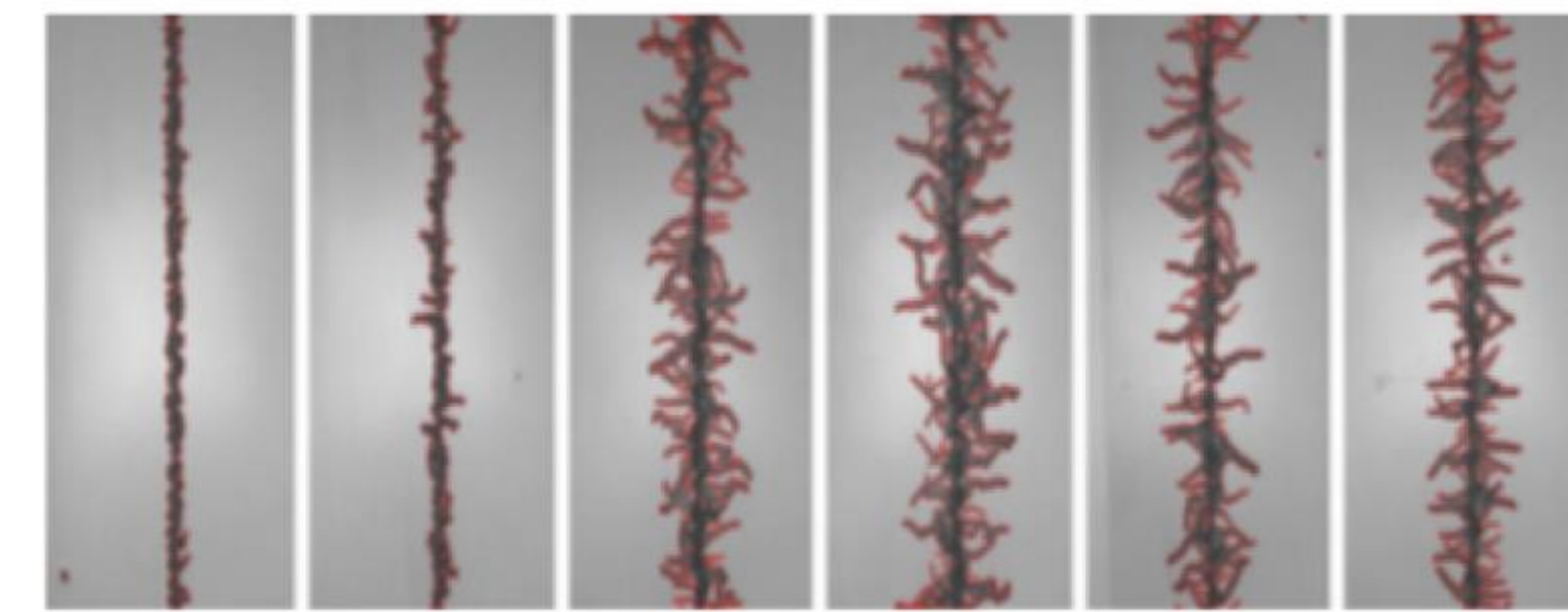
Ellen Bluett - EngD Year 3
Tata Steel
Academic - Dr Nat Wint
Industrial - Dr Arnoud de Vooy

The Role of Chromium Oxide in Suppressing Filiform Corrosion on Cr metal / Cr oxide coatings for steel used in packaging applications



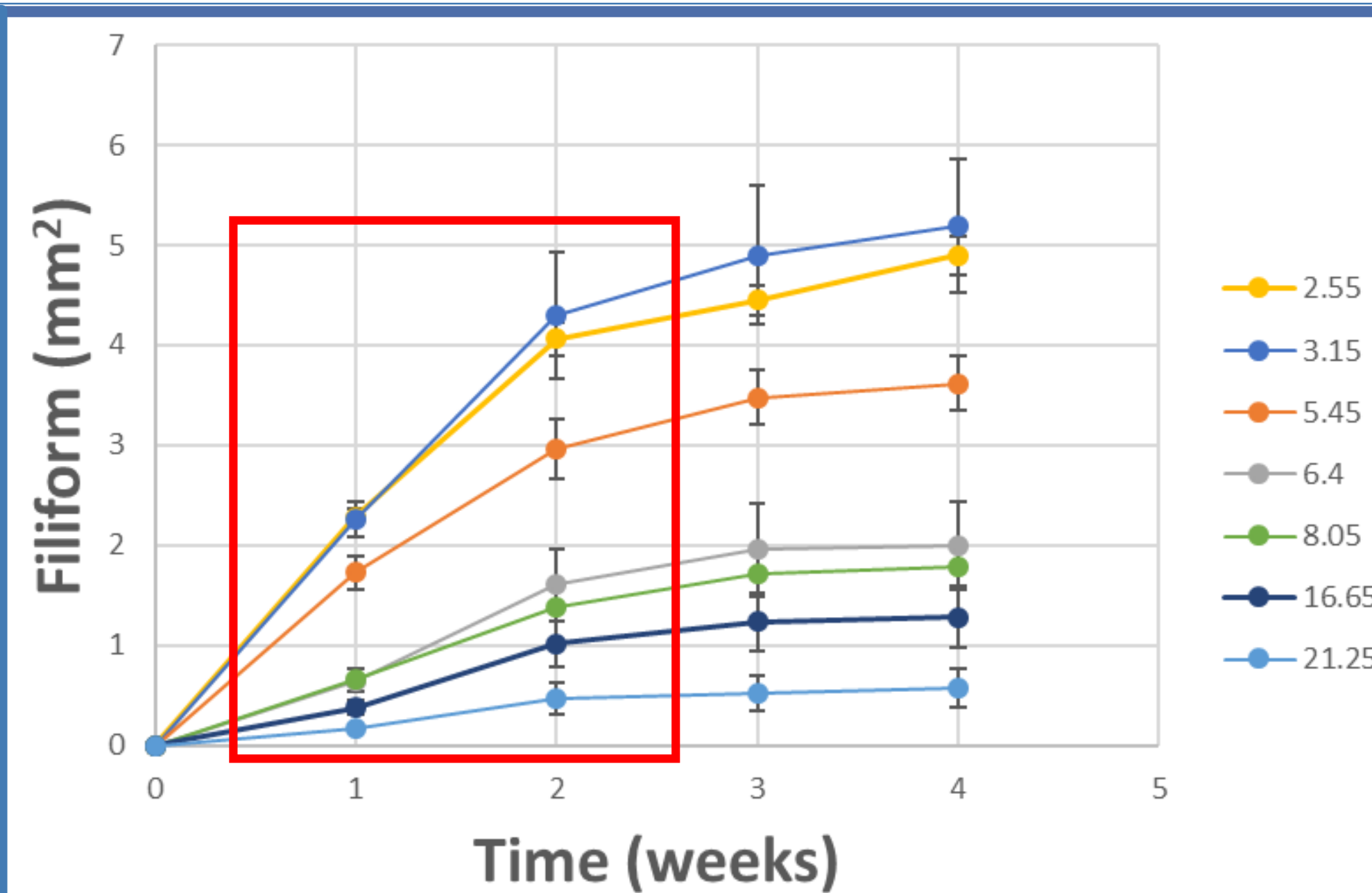
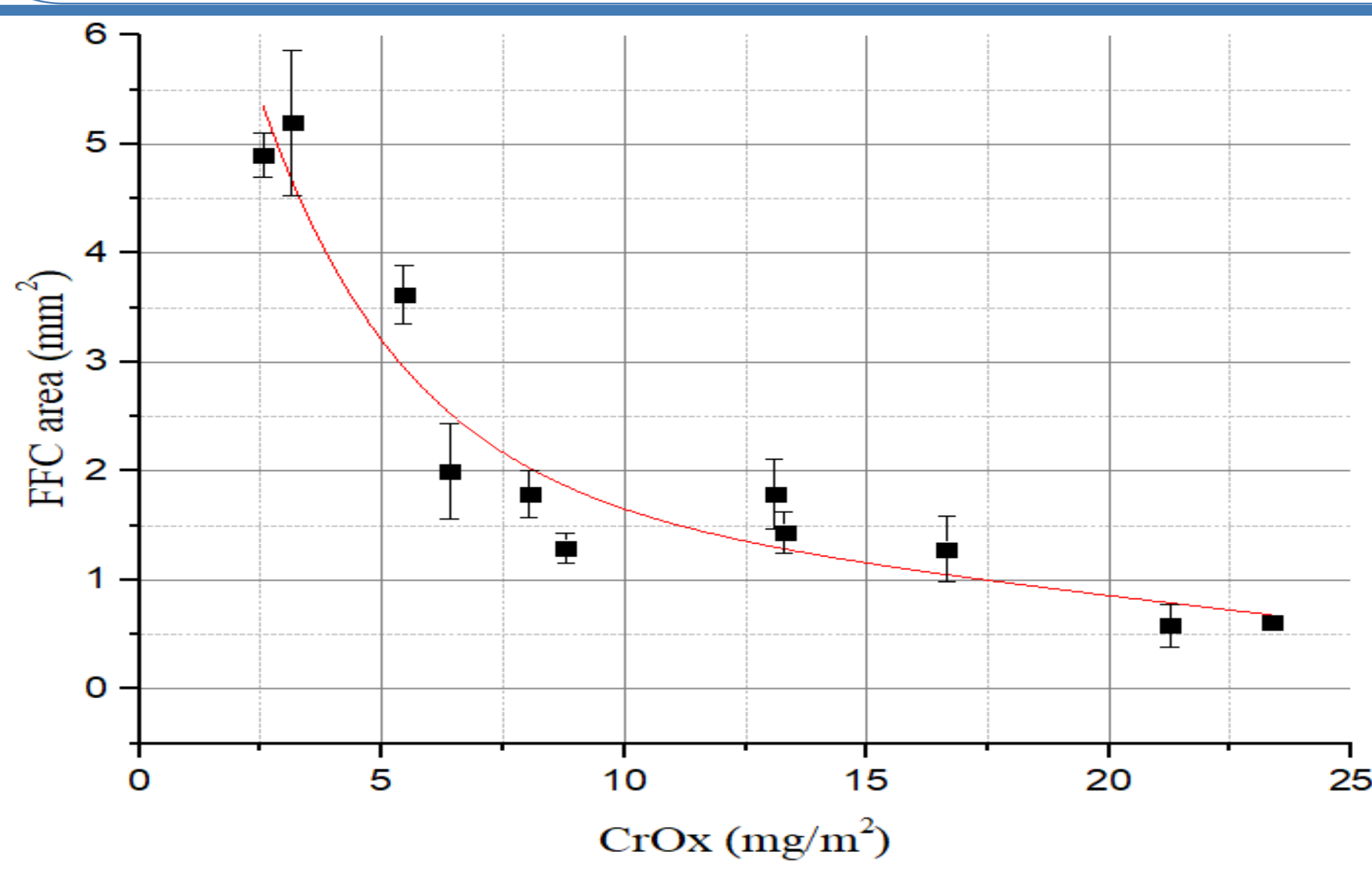
Background

- Electro chromium coated steel (ECCS) is currently used to make packaging materials. ECCS is nearing its sunset date due to the use of hexavalent chromium (Cr^{6+}).
- Trivalent chromium coating technology (TCCT[®]) is the potential replacement for ECCS.
- This research focuses on TCCT[®]'s corrosion resistant properties. Filiform corrosion (FFC) is a common form of atmospheric corrosion that occurs on packaging materials. It leads to the production of unsightly worm-like defects.

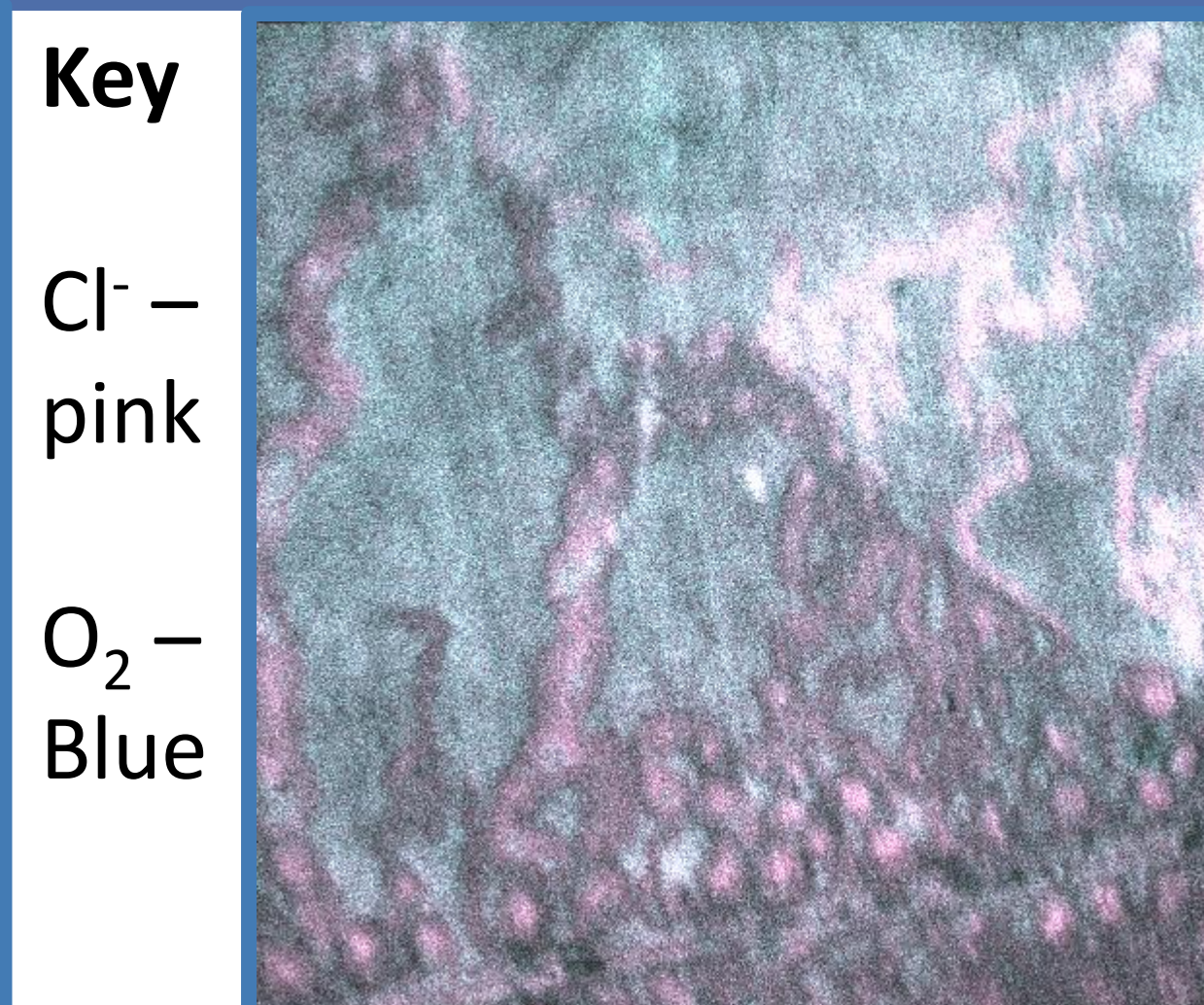
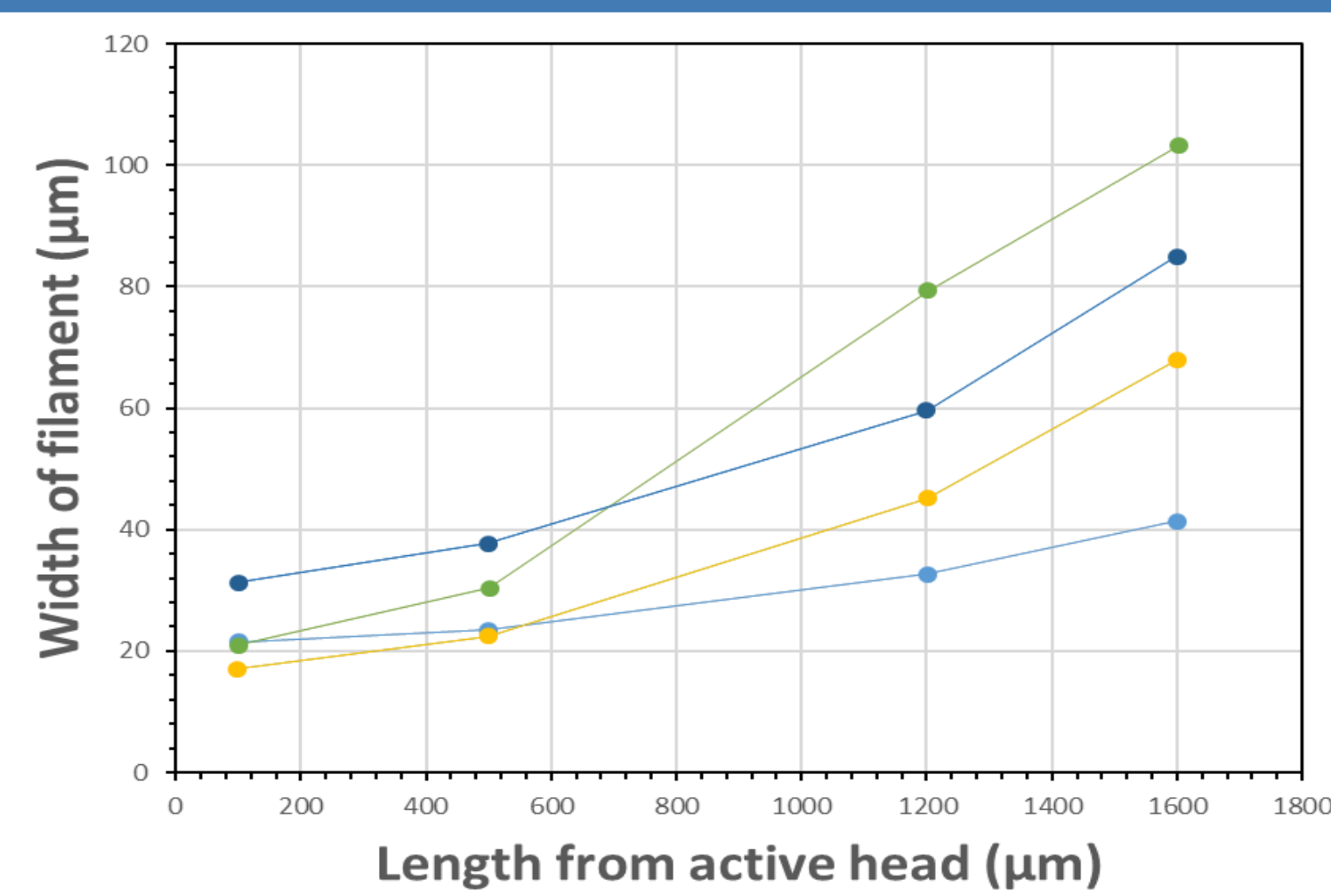
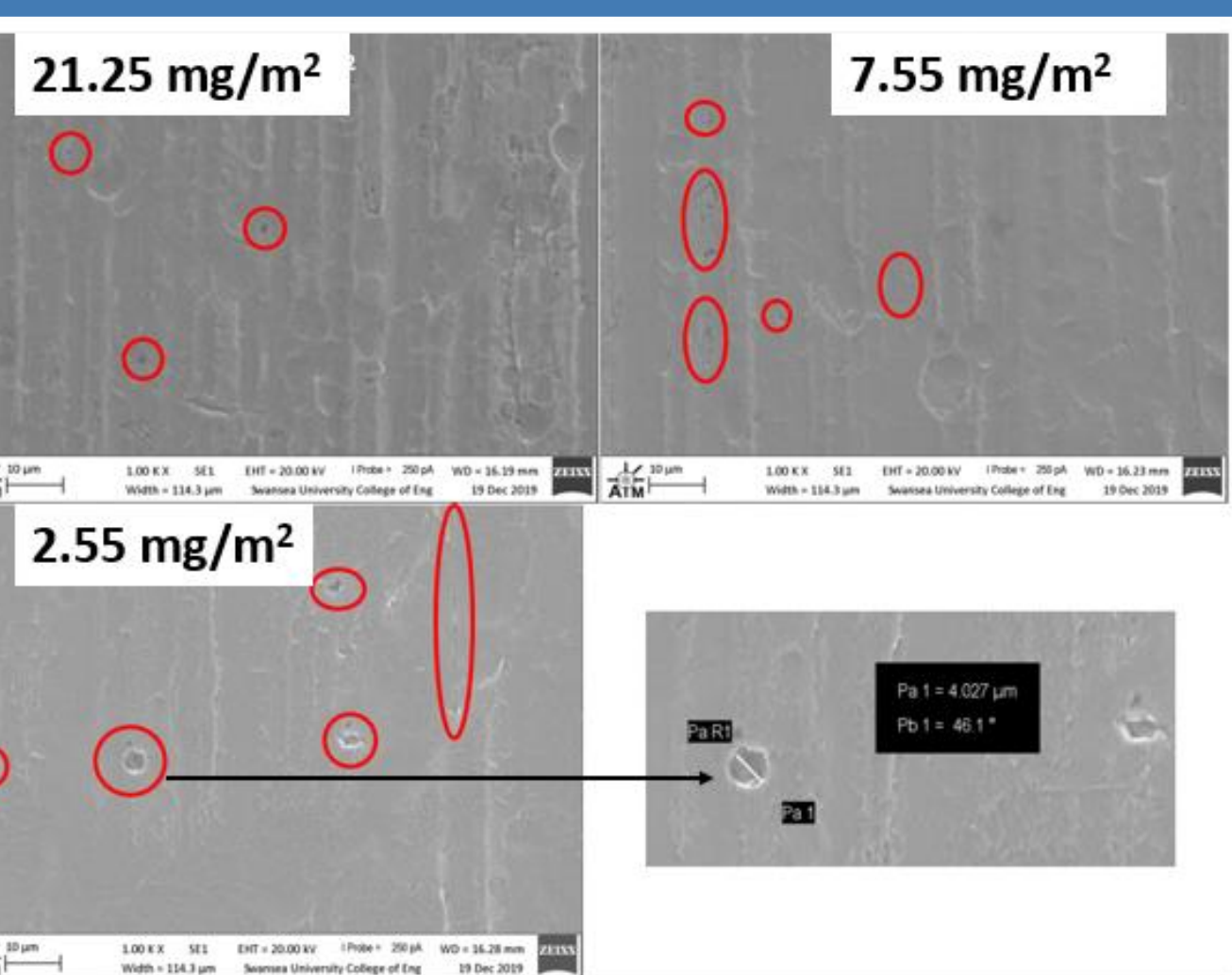


Investigation

- Samples with varying chromium oxide content were coated with polyvinyl butyral (PVB), scribed, filled with FeCl_2 and left in a humid atmosphere for 4 weeks.
- The area of filiform decreased with increasing chromium oxide content.
- The rate followed a linear pattern during the first 2 weeks then started to plateau out.



- It is suggested that the reduction in FFC area is due to decreases in microporosity in higher CrOx coating weights.
- It is suggested that the FFC rate decreases with time as the composition of electrolyte in the cell is changing.
- Evidence of tapering filaments was observed as was chloride entrapment in the tail of the filament suggesting that this theory is correct.



Conclusions

- Increasing CrOx, decreases the amount of FFC.
- The rate of FFC decreases with time due to chloride entrapment.



Swansea University
Prifysgol Abertawe



Engineering and
Physical Sciences
Research Council

EU Funds: Investing in Wales

