

Revisiting Atmospheric Corrosion of Active Metals : What We Have Learn't and What We Need to Learn

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Over the past decade there has been a re-awakening of the scientific study of Atmospheric Corrosion. This has built upon but extended past the exposure programs of the 60-90's. The research has looked at

1. The diverse aspect of the environment that can influence atmospheric corrosion
2. The forms of moisture layer that promote atmospheric corrosion
3. Identifying the diverse range of oxides that develop
4. Studying the morphology and form of oxides in section
5. Identifying fundamental mechanisms that control the corrosion rate
6. Modelling atmospheric corrosion across all its scales.

Prior to the last decade most work aimed at simulating the effect of atmospheric corrosion was carried out in NaCl solution although some very good work was undertaken on the effect of a range of gases. In the past decade tests have been undertaken in seawater, in acidified seawater, in concentrated salt solutions representing aerosols drops and acidified version of the same and in aqueous solutions combined with additional factors such as UV and ozone.

With the realization that corrosion in bulk solutions is very different to that in thin films or droplets and that these later forms are more realistic representations of the moisture forms in atmospheric corrosion laboratory tests have been undertaken on metals exposed to thin films and droplets. Further the droplet size has continuously decreased in order to replicate aerosol impacts.

A great deal of work has been undertaken to quantify the wide range of oxides that form in both laboratory and field conditions. An understanding of oxide forms and chemistry in laboratory tests under seawater has lead to a better understanding of the forms that occur in atmospheric exposures. However new techniques such as focussed ion beam – SEM have allowed sections through the oxide with minimal damage and revealed that oxides structures are layered and that surface measurements provide only a partial identification of the oxide phases

Both analytical and modelling work has sought to bring a fundamental understanding of what factors control the corrosion rate . In this they have only been partially successful and in the near future it is hoped that armed with all the additional information outlined above a more fundamental understanding of corrosion mechanisms in atmospheric corrosion can be developed.