A Study of the Effect of Environmental Conditions in China, South East Asia and Australia on the Corrosion of Zinc and Steel

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Traditional studies of corrosion of metals in polluted environments have concentrated on the effect of gaseous sulfur compounds and have established relationships between corrosion rate and the gaseous SOx level in the atmosphere. However recently it has become apparent that the interaction of metals with the environment is significantly more complex than indicated from these early models. Not only must a range of acid precursor gases be considered but also alkali precursor gases (notably NH3) , oxidants and particulate deposition must be considered.

To study this more complex interaction between metallic corrosion and the environment a large number of sights were established in China, Vietnam, Philippines, Indonesia, Thailand and Australia. At the majority of these sites, gaseous NOx and SOx, particulate chemistry and deposition rate, TOW, RH , plate surface temperature were measured. Further steel and zinc plates were exposed and examined to determine both mass gain on exposure, mass loss after cleaning and morphology and chemistry of oxide layers via FTIR and SEM-EDS.

Parallel to these field measurements a number of laboratory studies were undertaken to clarify factors promoting corrosion of metals. Whilst from these studies it is possible to develop dose functions between the various environmental parameters and zinc or steel, a phenomenological model of the corrosion rate of these metals is more valuable in increasing the level of understanding of the role and mechanisms of atmospheric pollutants in promoting particular surface processes. As such these paper explores the possible forms of and processes controlling such a model