

Evaluation of Atmospheric Corrosion in Steels for Corrosion Mapping in Asia

(アジアにおける腐食環境マップ作成に向けた鋼の大気腐食評価に関する研究)

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ABSTRACT

Abundant information on the atmospheric corrosion of metal, in both long-term and short-term exposure tests, have been published in the scientific literature. Those corrosion data were evaluated and bounded as ISO standards. Since those standards were made based on the European atmospheres, they might not be applicable for Asia atmospheres. To rectify such unfortunate situation the atmospheric corrosion mapping of structural materials in Asia area has been conducted under “E-Asia project”; It is the research cooperation between Japan (16 exposure test sites), Vietnam (14 exposure test sites), and Thailand (7 exposure test sites), which is supported by Japan Science and Technology Agency (JST). The environmental parameters such as Relative Humidity (RH), Time-Of-Wetness (TOW), Temperature (T), and chemical substances (SO₂ and Cl) were taken into account. The Atmospheric Corrosion Monitoring (ACM) sensors were also used to investigate the atmospheric corrosion behaviors for most of the exposure test sites. The artificial rainfall equipment was also developed and used to study the effect of chemical species and its concentration on the ACM sensors outputs and corrosion mass loss. The morphologies of corrosion product layers were also investigated by Scanning Electron Microscopy (SEM), X-Ray Diffraction (XRD), and Energy Dispersive Spectroscopy (EDS). The results revealed that the atmospheric corrosion behaviors in Asia region are somewhat different from the ISO standards. It was found that the critical temperature for the maximum corrosion attack is about 20 °C, while the ISO 9223 suggested 10 °C is the critical temperature. Moreover, there was a mismatch between the Corrosion Rate (CR) measured from the actual exposure test sites and the CR calculated based on the mathematical formula, called “*Dose-response functions*”, suggested by ISO 9223. In this research, a new mathematical formula for calculating CR in Asia region was proposed based on the environmental parameters, and the actual CRs investigated in Asia environment. And the corrosivity category classification was also made for each environment of each country.