Short Communication

The Transformation of Corrosion Products on Weathering Steel by Visible-Light Illumination under Simulated Marine Atmospheric Condition

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doi: 10.20964/2016.12.76

Received: 17 August 2016 / *Accepted:* 13 October 2016 / *Published:* 10 November 2016

This study has explored the visible-light illumination promoted corrosion behavior of weathering steel in simulated marine atmospheric condition. Open circuit potential measurements supplied a direct insight on this photovoltaic effect. To obtain better understanding on this process, the corresponding surface electronic properties together with its microstructures and chemical composition variations were characterized by Mott-Schottky analysis, AFM, XPS and confocal Raman microspectroscopy. All these combined results revealed that the rusted weathering steel sample collected in the dark displayed n-type photo-response due to the presence of hematite (α -Fe₂O₃), maghemite (γ -Fe₂O₃), lepidocrocite (γ -FeOOH) and goethite (α -FeOOH) on its surface. Whereas under illumination, the photogenerated electron-hole pair not only facilitated anodic dissolution and chloride ion adsorption but also leading to hematite to magnetite (Fe₃O₄) transformation in the metal/corrosion layer interface.

Keywords: Atmospheric corrosion; Corrosion products; Visible-light illumination

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