Corrosion behavior of carbon steel in Antarctic marine environment

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Abstract Atmospheric corrosion behavior of Q235 carbon steel exposed to Zhongshan station in Antarctica and the temperate Qingdao environment for 12 months was investigated. The results indicate that the corrosion rate of carbon steel exposed to Antarctica environment for 1 month is higher than that of the temperate Qingdao environment, while the corrosion rate of carbon steel after exposure for 12 months is lower than that exposed in the temperate Qingdao environment. The freeze-thawing of ice and snow causes the local long-period existence of thin electrolyte films to accelerate the corrosion of carbon steel. Pitting corrosion occurs when carbon steel is exposed to the Antarctic environment, and the skyward surface is more serious. The corrosion products of carbon steel are mainly composed of lepidocrocite, goethite, magnetite/maghemite, and akaganeite. There is no akaganeite in the corrosion products of carbon steel after atmospheric exposure in the temperate Qingdao environment. Electrochemical test results showed that the corrosion product layer formed after 12 months of exposure exhibit protection effect.