Study on Low Oxygen and Humidity Control Preservation Technology of Iron Cultural Relics and Its Correlation

Xiaoguang Guo[1], **Huahua Zhou**[1], Chunli Ding[1]

[1]*Tianjin CNRO Science&Technology Co.,Ltd and No.66,Gaoxin Road, Beichen Hi-Tech Zone,Tianjin,China*

Abstract: At present, there are many studies on the corrosion of iron cultural relics related to humidity. However, studies on the combined effects of oxygen concentration and humidity are scarce. The threshold of oxygen concentration to prevent corrosion is unclear, and it is urgent to clarify the quantitative relationship between corrosion rate and humidity/oxygen concentration. This study simulates the corrosion deterioration of rusted iron sheets under different relative humidity and oxygen content through orthogonal experiments. It adopts a combination of active and passive methods for active regulation of oxygen content and passive regulation of relative humidity in a flexible sealing bag. The oxygen content is set at 0.1%, 2%, 5% and 21% respectively, and the relative humidity is set at 10%, 20%, 30%, 40%, 50% and 60% RH respectively. The experiments show that the risk begins to emerge at 20% RH, but the risk is not significant at 20%~30% RH. The risk gradually increases at 40%~50% RH, while the risk significantly increases at above 60% RH. At a relative humidity of 10% RH, rusted iron sheet samples can remain stable and will not be affected by oxygen concentration. Therefore, for the preservation and display of iron cultural relics, relative humidity plays a decisive role in the corrosion deterioration of iron cultural relics, and is also an environmental indicator that needs to be prioritized for control in preventive protection. Passive regulation can be adopted to ensure the stability of iron cultural relics in an environment with RH < 10%, and there is no need to control oxygen.

Keywords Iron cultural relics; passive regulation; humidity and oxygen content; preventive protection

Reference

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