In-situ Analysis of the Rust Morphology of Unearthed Iron Relics and Research on its Mechanism

JIAO Xiaoke [1], JIANG Xudong[2], LI Qi[2], XIE Meng[2]

1 Institute of Chu Culture, Hubei Academy of Social Sciences, Wuhan, China

2 Department of Conservation, Hubei Provincial Museum, Wuhan, China

Presenter's e-mail address: 19113131272@163.com

Abstract In order to further study the different rust forms of iron relics, in situ analysis of the rust state of six iron objects unearthed in Hubei province was carried out by means of ultra-depth of field microscope, metallographic microscope, scanning electron microscopy-energy spectrometer and micro-Raman spectrometer. The results show that the rust of iron relics can be divided into two categories: 1) the original form of the general iron artifacts is clearly distinguishable. It's rust usually consist of iron oxides and C, with the microstructure of "trace image". 2) The original shape of the wrought iron ware is destroyed by the rust layer. The rust may consist of α-FeOOH, Fe_3O_4, α-Fe_2O_3, β-FeOOH and so on, while without "trace image" in the microstructure. The existence of a large amount of cementite and graphite in cast iron is an important reason for the remaining "trace image" structure in the rust layer and the preservation of the original form of the ware. Type I rust generally retains the original morphology of the objects, which can be preserved if it's harmless. Type I I rust often destroys the original surface of the objects, leading to difficult to identify their shape and patten, which need to be removed including harmless rust.

Keywords Iron relics; Rust morphology; In-situ analysis

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